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EDITORIAL

DEAN HENRY S. GRAVES: AN APPRECIATION

AT the end of the present academic year, Dean Henry S. Graves will retire as dean of the School of Forestry, Yale University, thus ending the active service of America's greatest forestry educator and forest administrator. Dean Graves has held and rendered distinguished service in the two most important forestry posts in the United States: the deanship of the Yale School of Forestry, and chief forester of the U. S. Forest Service. When one reads the story of his achievements, one reads almost the complete story of the advance of forestry in the United States.

Dean Graves graduated from Yale University in 1892. Later he took special courses at Harvard University, followed by a year's study abroad at the University of Munich. In 1898 he entered the government service as assistant chief of the Division of Forestry and remained there until 1900, when he was called to Yale University to organize the School of Forestry. He served as director of the school until 1910, when he was appointed chief of the U. S. Forest Service, a post he held until he resigned in 1920. In 1922, Dean Graves returned to Yale University as dean of the School of Forestry and Sterling professor of forestry.

These are but a few of the highlights of Dean Graves' long and distinguished career. They give an incomplete and inadequate picture of the contribution he has made to forestry on many fronts. During the World War, Dean Graves was assigned the task of organizing the forestry work of the A.E.F. He served as president of both the Society of American Foresters and the American Forestry Association, and as an officer in numerous organizations interested in the conservation of natural resources. Thus, many organizations profited by his sane idealism and shrewd judgment.

Much might be said concerning the development and progress of the U. S. Forest Service under Dean Graves' administration. Few people, however, were in a better position than his immediate superior, Secretary of Agriculture E. T. Meredith, to know how largely this development and progress were due to him. In regretfully accepting Dean Graves' resignation, Secretary Meredith wrote as follows:

"The decade through which you have guided the Forest Service has been notable in accomplishment, and the organization which you have developed to a high plane of efficiency has won not merely respect but the hearty approval of the West, which is perhaps most directly interested in it, as well as the country at large. More and more you have made the national forests serve the public welfare. Their usefulness has been expanded along lines which make the most of their productive resources, scientifically yet practically, and always with a sound, far-sighted public policy. You have seen to it that they are utilized in helping the home builder, in promoting local prosperity, and in contributing largely to the benefit of the people as a whole. . . .

"You have put the handling of the public forests on a thoroughly businesslike basis from every standpoint. Under severe handicaps and discouragements of a kind unknown in private business, you have secured an admirably trained

personnel, developed a system of administration which I believe to be unsurpassed in effectiveness in any branch of the government, and conspicuously stimulated, by leadership, a spirit of loyalty and devotion to the interests of the public in your organization. At the same time, you have recognized that the work must be based on technical knowledge—that the public welfare must be served by experts and specialists, just as private business is, if public ownership and management of the great public properties under the jurisdiction of the Forest Service are to meet with the highest degree of success. You have, therefore, emphasized the importance of scientific research and of the application of its results in the business of administration. The progress made under your direction in the development of the basic knowledge of forestry and in its practical application has been no less signal than the progress made in the building of an efficient organization and the working out of good business methods.

"You have also carried to substantial completion a great work of land classification, based on sound principles which it became your duty to formulate; so that large areas, in the aggregate, of agricultural lands have been opened to acquisition and conversion into farms, while the lands suited to permanent public ownership and administration for forest purposes have been classified as such—a step in itself of utmost significance for the permanence of the communities and the resources in question.

"On your initiative primarily a policy of road building for the development of the national forests and the benefit of the public has been entered upon. . . .

"These are large services. By wise judgment, energy, vision, and untiring devotion you have rendered them to a degree that has been and is the pride of all your friends. They entitle you to a large measure of gratitude from the public, to whom they have been rendered, and you may justly be proud of the record you have made."

Any man might be justly proud indeed of such a record; and yet Dean Graves' contribution to forestry education is probably even greater than that made to the Forest Service. During the twenty-eight years of Dean Graves' administration of the Yale School of Forestry, he molded and gave direction not only to the development of that school, but, vicariously to be sure, to every other forest school in the nation. Few fields of learning have been so profoundly influenced by one man as forestry education has been influenced by Dean Graves.

Dean Graves' greatest achievement probably is the fine and continued influence he has exerted on the young men who came to Yale University for more than three decades. These men left Yale University enriched not only by learning, but by a nicer conception of the attributes, the responsibilities, and the duties of an educated professional gentleman.

What are the characteristics of the man that gave him such power and influence over his students? This question does not lend itself to simple or ready analysis. Certain it is, however, that Dean Graves understands students, their problems, their weaknesses, their strength, and their ambitions. This understanding was not obtained by distant observation. Rather was it obtained by intimate contact. Despite his many duties and responsibilities, he was ever ready to discuss any problem with any student at any time. Probably no other thing is more appreciated by Yale foresters than the ease with which they could see "their Dean," and nothing made a more indelible imprint on the lives of these young men than the modesty, the simplicity, and the patience of the man, the sum total of whose achievements would make at least three men great. They were also impressed by the breadth of his scholarship, the soundness of his judgment, and his incorruptible intellectual honesty. Moreover, he lived without ostentation or pretention the life that every forester might well aspire to live.

Any consideration of Dean Graves' influence upon forestry students at Yale would be wholly incomplete without some reference to his gracious wife, Mrs. Henry S. Graves. As the wife of the dean of the Yale School of Forestry, she too had opportunities to influence the cultural and social development of students. These responsibilities she accepted willingly and effectively. The sojourn of many students at Yale was made more valuable and more pleasant because of her interest and help, and all are deeply appreciative of her efforts.

And now the active career of forestry's first citizen is drawing to a close. His life and achievements have been an inspiration to foresters the world over; he has dignified the position of chief forester; he has dignified the deanship of the Yale School of Forestry; and he has dig-

nified the forestry profession. All foresters, but especially those in the United States, are deeply indebted to him, directly or indirectly. They take this opportunity to express to him and to Mrs. Graves the hope that they may enjoy for many more years those highest satisfactions which are the inevitable result of the knowledge of having lived a useful and effective life.

From portrait by David Silvette

HENRY S. GRAVES

THE 1940 INTERNATIONAL FORESTRY CONGRESS IN FINLAND

By EINO SAARI

University of Helsinki

A committee was appointed at Budapest in 1936 to organize the International Institute of Forestry or Silviculture. There were discussions as to the proper location of its headquarters, whether at Rome, Vienna, Geneva, or Berlin. Several meetings of this international organizing committee were held during 1937 and 1938, finally resulting in Berlin being selected as the headquarters. The United States did not participate in the post-Budapest committee meetings, and it was understood that neither did England nor France. Technically, therefore, the United States is not represented in the International Institute of Silviculture. According to Dr. Saari, however, this Third International Forestry Congress is to be more or less autonomous (as far as the new International Institute of Silviculture is concerned), with Finland arranging all programs and details connected with the Congress. This puts a different light on possible participation by American foresters, as well as possibly by English and French foresters. In view of the above situation, I suggested to Dr. Saari, a Corresponding member of the Society who recently visited America, that he submit a statement. American foresters who expect to attend the forestry congress in Finland are requested to notify the Society of American Foresters, Washington, D. C.—Jno. D. Guthrie.

At the Second International Forestry Congress at Budapest in 1936, it was decided that the next congress would be held in Finland. Following this decision, the Finnish government in late 1937 appointed a committee to arrange for the preparation and organization of the Third International Forestry Congress. The committee consists of representatives of different Finnish forestry institutes, organizations, and industrial enterprises, under the chairmanship of Dr. Erik Lönnroth, Dean of the Agricultural and Forestry Department of the University of Helsinki.

During late December 1938, Dr. Lönnroth visited the International Institute of Agriculture at Rome and discussed there the proposals for the regulations and program of the 1940 Congress. The main lines of the Finnish proposals were accepted by the representatives of the institute, among them J. Clyde Marquis, American representative at the International Institute in Rome.

The Congress at Budapest in 1936 decided that there would be founded an International Institute of Silviculture in order to take care of future international forestry congresses and other international phases of forestry. According to the decision of the organizing committee of the institute, it will have its headquarters at Berlin and will cooperate with the International Institute of Agriculture at Rome. As this new institute will begin its first work possibly during the present year and the preparations for the next congress must go forward without delay, it was decided at the time of Dr. Lönnroth's visit at Rome and at a later meeting at Helsinki attended by German delegates making preparations for the new Institute of Silviculture, that the Third International Forestry Congress in Finland in 1940 would be organized by the Finnish government. The Finnish committee on arrangements was appointed by the government in 1937. Following this line-up the preparations are continuing in Finland. Official invitations will soon be sent out by the Finnish government and the Finnish organizing committee.

The congress will be held in Helsinki, the capital of Finland, in early July 1940. Before and after the congress there will be organized excursions to forests and mills.

During the latter part of June 1940, a few days before the Forestry Congress, the Congress of the International Union of Forest Research Organizations will also be held at Helsinki. The decision on the place of this congress was made in 1936 at the previous congress of this Union. According to the custom of the union a man from the next congress country was elected as the president of the union. He is Dr. Erik Lönnroth, mentioned above in connection with the forestry congress. The preparations for the research congress are also progressing in Finland and the invitations will be sent in due time to all members of the union. Excursions will be arranged also in connection with this research congress.

The Finnish forests and forest industry men hope to see a good number of American foresters and forest industry men with their wives in Finland next year. We shall do our best in Finland in order to make their visit pleasant and profitable.

It is perhaps worth mentioning that those who are interested in sport will have the opportunity to attend the Olympic games at Helsinki during the latter half of July 1940.

POSSIBILITIES OF STRATOSPHERE AND SUBSTRATOSPHERE PHOTOGRAPHY IN THE ADMINISTRATION OF FOREST LANDS

By F. R. WILCOX

Canadian International Paper Company

The use of aerial photography in connection with forest operations has developed rapidly during the past few years. It is now proposed to use stratosphere and substratosphere photography for the same purpose. The latter type of photography, although it presents certain technical difficulties, has many advantages which are discussed fully by the author.

THE use by foresters of aerial photographs has continued to develop during recent years. However, this valuable aid to forest management is not being used nearly as much as it might be, particularly by loggers. It is with reference to the latter group that these comments are written.

Any timber operator must expend an appreciable amount of money for the original photography before he can change his engineering procedure from the old and obsolete ground methods to the more economical aerial method. It is only natural that executives are reluctant to approve the expenditure of the necessary funds for photography.

The writer has appreciated this situation for a number of years and consequently has been endeavoring for some time to find ways and means of reducing this initial cost of photography.

In general it may be stated that the cost of photography varies directly with the scale. Furthermore, it has always been considered, for timber study purposes, that the larger the scale of the photography the more valuable the pictures are to the forester. This is only partially true and it is with this question of utilizing the smaller scale photographs that these remarks deal.

It is pertinent here to call attention to the fact that in this article "aerial photographs" means vertical photographs. Oblique photographs serve a definite purpose in forest management but they are a subject within themselves. In order to make clear the points desired, it is first necessary to summarize how aerial photographs serve the forester.

1. *As maps.*—Each aerial photograph is a map within itself. The science of assembling a number of photographs to form a composite map at a true and common scale is known as photogrammetry. The methods of map compilation from photographs are many and vary from crude inexpensive procedure to precise, expensive methods. The forester is not concerned with the latter methods; in fact he should steer clear of them as involving inconsistent accuracy. Suffice it to say that photographs provide a means whereby the forester may make a planimetric map without going into the field. The writer makes this general statement since, in his opinion, there are few if any areas of forest land in the United States or Canada where there is not sufficient existing control to permit the preparation of a sufficiently accurate forest map to meet the forester's needs.

2. *In timber typing.*—After the photographs have been used to produce the map their next function is that of providing a medium for making a preliminary type map which is later checked in the field. This work of timber typing should always be done under the stereoscope. An individual properly skilled in the interpretation of photographs can make a remarkably accurate type map, though obviously he must be familiar with ground conditions in the region covered by the photography.

Any forester will readily appreciate the advantages of such a preliminary type map. A few of these are:

(a) For inventory or valuation surveys of a large forest area when general figures only are required. A relatively few volume samples obtained on the ground and applied to the type areas will produce sufficiently accurate figures for this type of estimate. The writer has been associated with such surveys for the past ten years and surprisingly accurate results can be obtained.

(b) For planning a timber cruise no matter what its intensity, such a preliminary map is invaluable. In this connection it may be stated axiomatically that unmerchantable areas, such

as recent burns, muskegs, marshes and areas of young forest, are the easiest types to interpret and recognize on the vertical photographs. In other words, one is always certain in one's knowledge of the unmerchantable areas that do not require immediate investigation.

3. *Operating data.*—If a woods organization invests money in photographs, they can be made to serve their greatest value to the logger in providing operating data, obtained from photographs by carefully studying them *under the stereoscope.* The consistent use of photographs in this way by an entire woods organization from manager down would materially affect its economic operation and be a step towards the ever elusive "cheap logs" that are familiar, by hearsay at least, to all operators; and once the investment is made every person in the organization who has to do with the planning of operations should always carry photographs when travelling in new country and should have a stereoscope available at his headquarters.

A few more remarks about stereoscopic study of photographs for executive use may be made. It is difficult to get a busy administrator to take the time to become even casually skilled in the use of a stereoscope. In such cases the use of stereograms (complementary colored prints) projected upon a screen has possibilities. The stereoscopic image can then be seen simultaneously by any number of observers by merely using spectacles containing glasses of the same complementary colors. This has obvious advantages over the stereoscope. The use of stereograms has not yet been exploited by foresters.

With practice the logger can determine from stereoscopic study of photographs (a) the accurate boundaries of each logging chance, (b) total miles of main and branch logging roads, (c) average skidding distances, and (d) location of cliffs and other obstacles to logging. In fact, all the elements of landed cost estimating are available.

It is well to point out here that it is not for a moment suggested that field work be entirely omitted. The operator must still see as much of his ground as time will allow. The average logging superintendent seldom has time to see every corner of his district.

4. *Volumetric data.*—The possibilities of determining timber volumes by aerial photographs have been only slightly exploited on this continent. There are unusual possibilities in this direction from tree counts on large scale photographs. Stand profiles have been very successfully made in Germany and other continental countries by means of the more elaborate compound stereoscopes (plotting machines). The volumetric study of vertical aerial photographs is a complete subject within itself and cannot be dealt with in detail here. Suffice it to say that it is worthy of consideration and must be considered in the deductions that follow.

So much for procedure; now let us consider the photographic specifications, chiefly in respect to scale which will best serve the forester. It has been more or less accepted practice in the past for foresters to have their photographs taken with a combination of lens and altitude that would produce a scale of 800 feet to the inch.[1] There are many factors influencing the most desirable scale. However, for general conditions in the East at least, 800 feet to the inch is the desirable scale to serve all four divisions of use to which a forester puts his pictures. Unfortunately pictures of such a scale are expensive. It is not possible to quote prices because the cost factors vary widely with each project.

We now come to the question of stratosphere and substratosphere photographs.[2] It is obvious that the higher one goes to take one's photographs the larger will be the area covered by each photograph. For mapping purposes alone, then, the cost of compilation is greatly reduced because fewer units need to be compiled. It also follows that the cost of flying is at a minimum. For the quality of map required for forest management purposes one may go to almost any altitude (Fig. 1) and still obtain

[1]The scale of any photograph in feet per inch is obtained by dividing the altitude of the aeroplane in feet by the focal length of the lens in inches.

[2]The space above the earth's surface is divided into two primary regions. The first is the troposphere, which is the dust-laden region of clouds, variable temperatures, and turbulent air currents. Beyond the troposphere is the stratosphere in which the temperature is found to be nearly constant and in which there are no rising and descending air currents. The height of the troposphere varies with season and latitude; it is usually encountered somewhere beyond 30,000 feet. The stratosphere flight of the balloon *Explorer II* encountered the stratosphere at 37,000 feet.

The lack of turbulent air currents has a favorable effect on high altitude photography insomuch as "tip" and "tilt" can be reduced to a minimum. It is obvious also that navigation should be at its best with resulting straight flight lines and therefore a minimum of photographs. With proper motor supercharging, maximum speed per horse-power is possible.

pictures with sufficient clearness of detail. Until very recently there have been few aeroplanes that had a ceiling of more than 20,000 feet. Another complication has been the need for oxygen equipment when flying over 18 or 20 thousand feet. The equipment is both cumbersome and annoying.

The problem of obtaining small-scale photographs has an alternate, partial solution, namely the use of short focal length lens. During the past several years there has been extensive experimentation with the so-called wide angle or short focal length lens. Some very interesting results have been obtained with focal lengths of about six inches. However, difficulties are introduced in that the margin of the photograph becomes blurred with the result of a reduced useful portion. There is also a loss of quality in the stereoscopic image. The standard specification established by the American Society of Photogrammetry still calls for nothing less than an eight-inch lens. The writer favors the use of the high altitude rather than the short focal length lens.

The expression of these opinions was prompted by the recent appearance at the 1938 Chicago air show of a new aeroplane (Fig. 2). This ship has been designed for aerial photography and so far as is known it is the first civilian aeroplane to be designed solely for photographic work. The "bug bear" of photographic pilots has long been the lack of visibility for navigation, which is so important for the attainment of economy in photographic flying. The solution of this problem by an all glass nose is possibly the ship's most important feature. Secondly, it is provided with a supercharged cabin which eliminates the use of cumbersome and annoying oxygen equipment by the crew. The ship is reputed to have unusual flying performance (caption Fig. 2).

The advent of this aeroplane should be welcomed by foresters interested in a more economical use of aerial photographs. There is no doubt that in the near future high altitude

Fig. 1.—The highest vertical photograph ever taken; made from the balloon *Explorer II* of the National Geographic Society - U. S. Army Air Corps stratosphere flight in 1935. The exposure was made 69,780 feet above the ground. A careful study of the photograph indicates remarkable detail. The area covered is approximately 105 square miles. Unfortunately no forest land is included in the photographed area. For forestry purposes a single picture such as this one would produce a sufficiently accurate planimetric map of 60 square miles. The possibilities of such a mapping medium are not difficult to appreciate. Developments constantly being made in photographic emulsions, increased fineness of graining, new types of filters and improved quality of lenses, all tend to make stratosphere photography more and more practical.

Fig. 2.—Stratoplane designed and manufactured by Abrams Aircraft Corporation. The development of this plane is an advance towards cheaper aerial photographs. The first model was designed for a 450 h.p. motor which the manufacturers state will take the ship to its service ceiling of 25,000 feet in 25 minutes. Successive models will be powered up to 1,000 h.p. with correspondingly high ceiling. Performance, stability, and visibility are highly developed. The manufacturer, Abrams Aircraft Corporation of Lansing, Mich., deserves considerable credit for this contribution to aerial photography.

Fig. 3.—Types of oxygen equipment in common use in high altitude photography. A super-charged cabin does away with the necessity for such equipment, which is always cumbersome and inconvenient. Photography courtesy Abrams Aerial Survey Corporation, Lansing, Mich.

photographs will become of increasing importance and will have much to do with the wider use of photographs by foresters.

To return to the application of high altitude photographs to forest administration, there is no doubt that a good planimetric map can be made from photographs taken at any altitude no matter how high. The highest vertical photograph ever taken (Fig. 1) produced an excellent map. It is in the cost of the map that the forester effects his greatest cash saving through the use of aerial photographs. It is impossible to give detailed figures without a lengthy qualifying statement, but it can be said that the saving resulting from the use of normal verticals (say at 1,000 feet to the inch) over purely ground methods is somewhere between $12 and $20 per square mile. Stratosphere and substratosphere photography might well be expected to double this saving.

Timber typing can be executed satisfactorily for inventory purposes from high altitude photographs provided the photography is carried out during either spring or fall when contrasting foliage colors exist in the forest crown. If the work is done in midsummer, infrared photography can be relied upon to produce the same results.

To obtain operating and volumetric data from photographs, a detailed study must be made of relatively small areas. Here a very large scale photograph (600 to 800 feet to the inch) is required. It is seldom economical or desirable to photograph large areas at this scale. The forest as a whole should be photographed on a small scale, and annually the areas for the next year's operations should be photographed on a large scale. Such an annual program can also provide cut surveys and estimates for revision data.

For a number of years the writer has been advocating small scale, high altitude photographs supplemented by strips of large scale photographs placed in a similar manner to the usual cruise line layout to provide general estimates for inventory and appraisal work. The small scale photographs provide the planimetric and type map. After the photographs have been studied and "typed," the locations for the large scale strips may be determined. The strips will provide stem counts and height measurements (shadow measurement) to form a basis for volumetric data. Field work is carried out in the large scale strip areas.

Conclusion

Aerial photography offers unusual opportunities to the forester. The initial cost of the photographs can be greatly reduced by a greater appreciation and wider use of small scale photographs taken from the tranquil region of the stratosphere and substratosphere. The recent appearance of the Abrams "Stratoplane" will make available to the forester a new type of photograph.

FUELWOOD CONSUMPTION IN THE LOWER SOUTH

By ROBERT K. WINTERS

Southern Forest Experiment Station

Studies of the Forest Survey are showing the relative importance of fuelwood as an item of drain against the growing stock of southern forests. The magnitude of the use, together with a description of the procedures used to arrive at the final results, is presented in the following article.

ONE important phase of the Forest Survey now being made by the U. S. Forest Service is the determination of the volume of wood that is removed each year from the forest growing stock of the area surveyed. In the southern states, although fuelwood is usually one of the three or four most important items of forest drain, it probably is the most difficult to measure with precision. In any considerable area, thousands of homes use wood as fuel, but for the most part the individual families have little knowledge of the quantity consumed in a year.

The purpose of this paper is: (1) to present the methods employed by the Survey to calculate the fuelwood used in the South by Survey units, (2) to present some of the results of this study, and (3) to interpret some of these results in the light of local conditions and habits of the population.

Fuelwood consumption can be divided roughly into two broad classes: residential and commercial; in nearly all parts of the South the volume of the former is far greater than that of the latter. For the purposes of this study three kinds of residential fuelwood use were recognized: (1) rural farm use, (2) rural nonfarm use (scattered homes not connected with farms and in villages of less than 2,500 population), and (3) urban use.

The basic approach to the problem of residential fuelwood use was the U. S. Census Report of 1930, which shows the number of white and colored families in the three groups given above. With the average volume of fuelwood used per family in each of the three classifications determined, it was a matter of arithmetic to arrive at the total volume of domestic fuelwood consumed in any given area.

To obtain first-hand data on the current residential consumption of fuelwood, during 1934 to 1936, field men took a specially prepared questionnaire to about 2,100 farm families, 625 rural nonfarm families, and 850 urban families distributed among the Survey units as shown in Figure 1. Certain Survey units (well distributed over the entire South) were sampled fairly intensively, while other units were sampled only sufficiently to indicate that the domestic fuelwood use fell into the pattern established by the more completely sampled areas. In only four units were no data secured.

On these questionnaires the first question was, "How many standard cords of fuelwood does your family burn in a year?" To many, it might seem that the answer to this question should be simple, direct, and reliable; but not so for the average householder in the South. In most instances he brings in his wood in small quantities as needed. The estimate, therefore, is a liberal interpretation by the field canvasser of the vague replies of the householder.

Fuelwood data, however, were secured also from families who anticipated their needs, had their wood cut and ricked, and knew their approximate fuelwood use. These, on the average, live in better constructed houses, probably maintain a more comfortable winter temperature in their homes, and may, therefore, use either more or less wood than the typical farm family. The fuelwood consumption of the average farm family, as determined by the Survey, is based on a sampling of various types of farm families.

In addition to determining the gross volume of fuelwood used by the individual family, the best information obtainable was secured regarding the portion that came from dead trees, from cull trees, from the tops of trees cut for other purposes, and from sawmill waste. The remainder was considered to have come from the sound, living trees that make up the growing stock of the forests. Fuelwood from the live growing stock was further classified as coming from trees of sawlog size (9.0 inches and larger d.b.h. in pine and 13.0 inches and larger in hardwoods) or from those under sawlog size.

Sampling of individual homes was done in an arbitrary manner. Rural homes were sometimes sampled by stopping at every fifth house along

a given road. Fuelwood used by urban families was determined by various sampling methods. In some cities residents of every fourth house on a given street were questioned regarding the fuelwood used; in others, those in the first house in each block; and in still others, the inhabitants of every house in the section studied were questioned.

Other items of information were used as aids in arriving at estimates of urban domestic fuelwood consumption. For example, in the natural gas areas, where gas is commonly used for heating purposes, municipal gas companies were visited to ascertain the number of gas meters in given cities. In a few large cities, post-card questionnaires were sent out to addresses selected at random from city directories; on these the recipient was asked if fuelwood was used, and if so for what purposes (cooking, heating, and kindling). The results of the Civil Works Administration study, *Real Property Inventory, 1934* made in 64 U. S. cities, showed for several cities in Survey territory the number of dwellings using wood as fuel.

Several methods were used to determine the use of fuelwood by commercial establishments. The fuelwood use was ascertained of all (more than 1,100) turpentine stills that were visited for other information. A sampling of cotton gins was made to obtain enough fuelwood data to develop a series of factors showing average number of bales of cotton ginned per cord of wood in gins of varying annual production. From published figures of the U. S. Bureau of

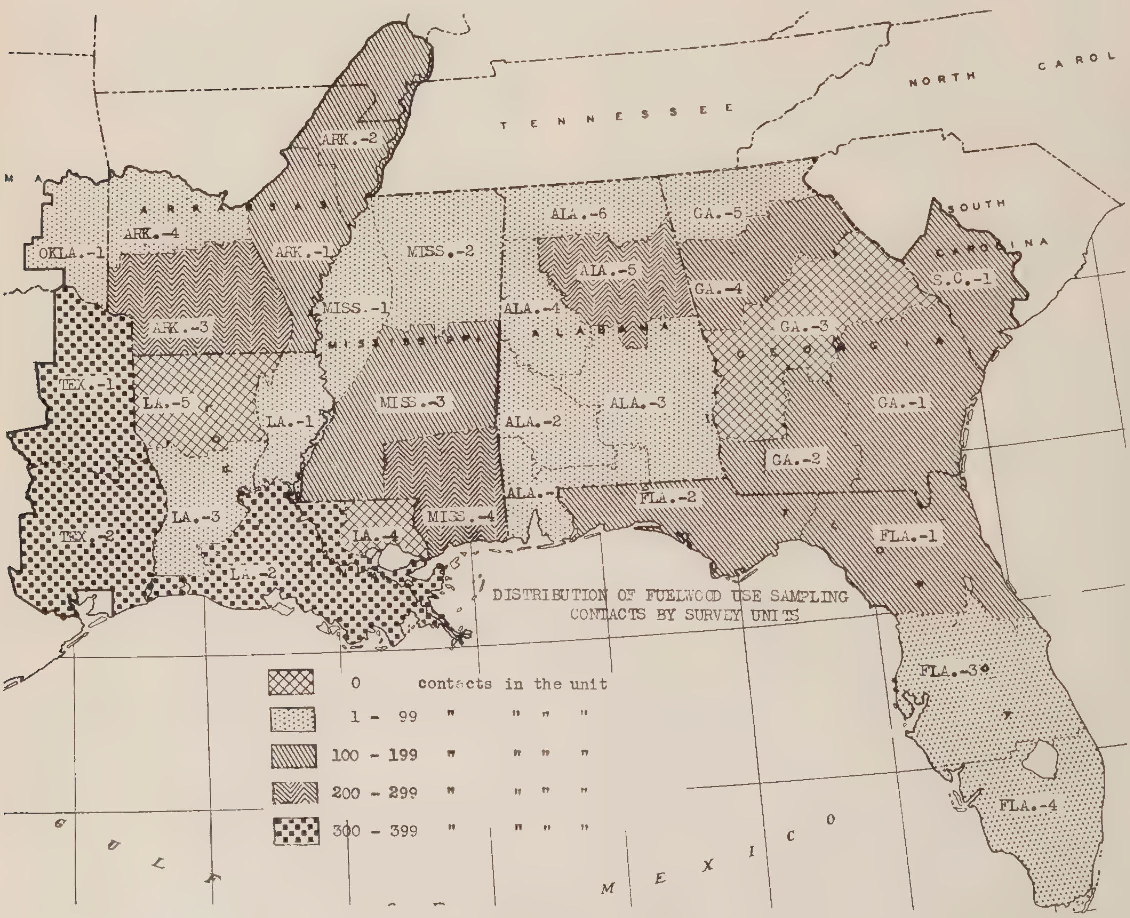

Fig. 1.—Distribution of fuelwood use sampling contacts by Survey Units

the Census[1] on the total number of cotton gins by counties, the number of gins was obtained for each county in every Survey unit. The approximate percentage of those that used wood as fuel was obtained by field sampling or from the local county agents. From this information, plus the average number of bales ginned by each gin, the fuelwood-use was calculated by individual counties and totaled for each Survey unit. Questionnaires were taken also to miscellaneous commercial establishments, such as creameries, bakeries, brick yards, laundries, and pressing establishments. Hhe average annual volume of fuelwood used per establishment was thus obtained. The number of establishments for a given unit was obtained from Dunn and Bradstreet and the total commercial fuelwood use was thus derived by multiplication. After following this procedure in a few Survey units, the aggregate use was found to be too small to justify the laborious tabulation of number of establishments from Dunn and Bradstreet. Accordingly, a series of factors was developed to show the commercial fuelwood use per capita in cities of varying size in units already studied, and the appropriate factor was then applied to the population of each city in any Survey unit.

Rural school teachers and county superintendents of education were questioned concerning the average amount of fuelwood used per school, or per room for both white and colored schools. From reports of state school superintendents, the number of schools, or rooms for Survey units was obtained and the fuelwood use was then calculated.

It was found that the annual farm fuelwood use for white families varies between approximately 4 standard cords per wood-using family in southern Florida to a maximum of about 15 cords per family in the mountainous portions of Georgia and Alabama. In general, for the Coastal Plain and Piedmont units of the Southern Survey territory, however, the average annual use for white farm families is consistently about 9 to 11 cords. In practically all units, colored rural farm families use less fuelwood than whites—generally between 6 and 10 cords per family. This difference is probably due to the willingness of colored families to accept less comfortably heated living quarters than the average white family. On the average, colored families in the Mississippi River Delta use somewhat less fuelwood than colored families in other Survey units, probably because of the increased difficulty of securing fuelwood in the highly developed agricultural bottomland areas of the Mississippi River. With the possible exception of the natural-gas area of north Louisiana, the coal area of Alabama, and the practically timberless portion of Missouri in the Mississippi River Delta, nearly all farm families use wood as fuel.

In the parts of the South where mixed pine and hardwood forests abound, generally more than half of the farm fuelwood is of hardwood species. In the bottomlands of the Mississippi River, hardwoods only are used, but in the naval stores region along the Atlantic and Gulf Coasts, from South Carolina to eastern Louisiana, pine species account for most of the farm fuelwood.

Of the gross fuelwood used by farm families, only a part constitutes a direct drain on the living, sound-tree component of the forest. In most Survey units, 50 to 75 percent of the farm fuelwood used came from dead trees, cull trees, tops of sawlog-size hardwood trees cut for other purposes, and from trees on areas being cleared for agriculture. A large part of the farm fuelwood used in the coastal, longleaf, and slash pine regions comes from dead heart pine or "lightwood," as it is called locally.

In comparing nonfarm and farm consumption it can be stated that: (1) a smaller percentage of village and city families use wood for fuel than farm families, (2) colored non-farm families on the average use as much or more fuelwood than nonfarm white families (white families probably use more coal and gas for fuel than colored families and also live in better constructed houses), and (3) in most Survey units 50 to 90 percent of the nonfarm fuelwood consumed does not constitute a direct drain upon the forest, but comes from dead trees, cull trees, sawmill waste, tops and limbs, and from areas being cleared for agriculture.

In most Survey units the fuelwood used by commercial enterprises accounted for less than 10 percent of the total consumed. Locally, however, certain items of commercial fuelwood consumption were important. In the naval stores region, for example, fuelwood for use in turpentine stills alone amounted to about 3 or 4 percent of the total fuelwood used. Survey data show that, on the average, approximately one-fifth of a cord of

[1]Zimmerman, H. J. Cotton production in the United States. Crop of 1934. U. S. Dept. of Commerce, Bureau of Census.

fuelwood is required at the turpentine still to produce a 50-gallon barrel of turpentine with its accompanying quota of rosin, although this figure may vary considerably from still to still, depending upon the efficiency of the plant and the quality of the wood. Wood-burning cotton gins produce 3 to 5 bales of cotton per cord of fuelwood. Throughout much of the rural South, syrup making for home consumption is common. In these open-air syrup mills, one cord of wood will produce about 50 to 80 gallons of syrup, depending upon the kind of syrup produced and the kind and quality of wood used. In general, making sorghum syrup requires more wood than making cane syrup; average figures are 75 gallons of cane syrup per cord and 50 gallons of sorghum syrup per cord of fuelwood used. Wood is also used in the processing of flue-cured tobacco. On the average, this requires one and one-half cords of fuelwood per 1,000 pounds of dried tobacco.

The total volume of fuelwood consumed annually in the area covered by the Survey (Fig. 1) is estimated at 22.3 million cords, of which 10.6 million cords is pine, and 11.7 million cords, hardwood. This use resulted in an actual drain upon the forest growing stock of 8.9 million cords, the remainder coming principally from dead trees, cull trees, tops and limbs of sawlog-size hardwoods, and mill waste. In 1936 fuelwood accounted for more than 20 percent of the total drain on the forest growing stock. In the same year lumber, the only other large single item, accounted for nearly 55 percent.

Survey reports show a relatively large volume in cull trees and trees of commercially inferior species, which should be removed from the stand to improve forest growing conditions and increase the increment of commercially valuable wood. The use of cull trees and inferior species for fuel in place of thrifty trees of potential commercial worth offers a practicable means (a) of meeting the need for fuelwood without depleting the forest growing stock and (b) of improving stand conditions for the maximum production of high-quality forest products.

Mexico's Campaign Against Forest Fires

1. Only ignorance can permit the destruction of forests which are part of our national wealth.

   Help in the campaign for reforestation of our country, which the government is carrying out.
2. Do not permit the destruction of the forests which are part of Mexico's wealth.

   Help in the campaign for reforestation of our country, which the government is carrying out.
3. Since natural wealth is an important factor in the economy of the country, every citizen is in duty bound to help conserve it. Fight against forest fires.
4. Do not scatter matches or cigarettes in pastures and forests while they are still afire. A small act of carelessness may lead to disasters.
5. When making bonfires near or on ground with vegetation, put them out when leaving to avoid fires in the forests or on pasture land.
6. The laws punish individuals for causing fires in the forests both intentionally or through carelessness.
7. You must conscientiously cooperate with the work which is being carried out against fires in the forests and on pasture land.
8. To combat forest fires successfully, the cooperation of all inhabitants of the country is both urgent and necessary.—From *Protection of Nature*, Vol. 3, No. 4, December 1938, Mexico. (Translation by Dr. C. P. deBlumenthal.)

CHEMISTRY IN THE EDUCATION OF A FORESTER[1]

By EDWIN C. JAHN

New York State College of Forestry

Forestry is an applied science based on the natural sciences. Because of this fact most forestry curricula include a smattering of work in all the natural sciences. In a sense this is a desirable situation; in another sense it is an undesirable situation. It is desirable in that it acquaints the student with a rather broad section of the world's scientific knowledge; it is undesirable in that the acquaintance must, because of lack of time, be somewhat superficial. Many educational advantages would result from having each forestry student pursue at least one natural science far beyond the beginning or elementary course. Dr. Jahn develops the case for chemistry. A somewhat similar case could be developed for physics, for mathematics, for geology, or for zoology. Full and complete training in any science would focus attention on the value of thoroughness than which nothing is more necessary or desirable in any program of professional education.

THE sciences of physics and chemistry are concerned with the phenomena of the physical world, i.e., with all the materials and energies of the universe. The boundaries of these two sciences merge, and, in their broader aspects, they may be considered as one. But today physics is generally considered as the science of matter, involving no chemical changes. Chemistry is concerned with the composition of substances and of their transformations. Chemistry and physics are, therefore, basic sciences whose laws and principles extend inexorably through all other natural sciences.

The existence and behavior of living organisms are governed and motivated by physical and chemical laws. Every cell or organization of cells is a most delicate and intricate chemical-physical laboratory. The internal physical and chemical phenomena of living organisms, such as colloidal surface reactions, diffusion, capillary flow, organic synthesis, and delicate catalytic reactions are influenced by external physical and chemical factors such as temperature, light, wind, gravity, water, other living organisms, and the soil. Since a forest is a very complex association of trees, other plants, animals, and micro-organisms, the effect of external factors and of competition is most complicated on a forest community.

The problems with which forestry deals are highly diversified and require a broad basic training in the natural sciences, mathematics, surveying, and economics. Forestry is an applied science based on chemistry and physics, the botanical sciences, soils and geology, and zoology. Of the foundation studies for forestry, none is more important than chemistry. A very excellent and concise statement on this subject is given by Graves and Guise[2] in their book *Forest Education.*

Need for Chemistry in the Practice of Forestry

Although the reasons for instruction in chemistry as a preparation for forestry may be generally recognized, there is, nevertheless, considerable difference of opinion as to how much chemistry should be required and how it should be taught. Is one year sufficient or are more desirable? Should chemistry be taught to foresters in a thorough fundamental course as is required for majors in chemistry, or is a general survey course more desirable?

Before answering these and other questions, let us examine the need for chemistry in the practice of forestry and in the education of a forester.

As basic education.—One of the objectives of education is to give the student a better comprehension of the world about him. Chemistry (and physics) acquaints the individual with the fundamental concepts and laws of nature. It gives him a better understanding and appreciation of the world of which he is a part. Therefore, chemistry should be an important part of any scheme of higher education. A law professor recently stated that chemistry should be included in the law curriculum, because many of the industrial and other cases which come up involve chemistry, and if the lawyer has no ability to understand and evaluate the chemistry involved he is severely handicapped.

As previously stated, forestry is an applied science based on the natural sciences, including chemistry. Chemistry is basic to all natural science. Chemistry, therefore, should be a part of the basic training of all foresters. It may be

[1]Read before the Forestry Section, Northwest Scientific Association, Spokane, Wash., December 28, 1937.

[2]Graves, H. S. and C. H. Guise. Forest education. Yale Univ. Press. 421 pp. 1932.

further argued that the training in the techniques of observation, analysis, and reasoning obtained in chemistry is of vital importance and value to a forester.

In silviculture.—The practice of silviculture is based largely on a knowledge of botany, particularly dendrology, ecology, and physiology, on pathology and entomology, and on geology, soils, and meteorology. Training in the principles of chemistry is essential for a proper understanding of physiology, ecology, and soils. The chemistry involved in the growth and life processes of trees, the effects of environment on the biochemistry of the tree, and the chemistry of the soil and its relation to nutrition, growth, and the character of the stand are all essential to the intelligent practice of silviculture. The chemical composition of the soil has a very important, but as yet little understood, effect on the growth of trees and the nature of a forest. Certain chemicals are essential to growth, others have been recently discovered which, when added in exceedingly small amounts to the soil, greatly stimulate growth and even change the behavior of the trees.

The chemical changes taking place in humus, the effects of thinning, logging, and fire on the chemistry of a forest are other important factors to consider in silviculture. A more simple yet important application of chemistry to silviculture is the treatment of seeds by certain chemicals to hasten and stimulate germination.

It is not expected that every forester should be a specialist in soil or physiological chemistry, but he should know sufficient chemistry to understand, interpret, and apply chemical data and make simple observations.

In forest protection.—In protection from fire, physics is more fundamental than chemistry. A knowledge of the effects of temperature, humidity, and other meteorological factors on the inflammability of duff are a direct application of physics. Chemistry, however, may play a part in fire control in the future. For example, chemical sprays might be used to check or retard fires. A recent article by Offord and d'Urbal[3] contains a discussion on the use of chemicals in burning wet brush piles. This holds interesting possibilities for controlled slash burning.

In forest pathology, a knowledge of chemistry is necessary for an understanding of the action of fungi and other parasites on wood or other tree tissues. Control measures involve the use of toxic chemicals in many cases.

In forest utilization.—Wood is an organic tissue produced by biochemical processes from air and water. The soil furnishes the water and various essential catalytic chemicals. Wood is a very complex chemical substance, and is an important raw material for chemical industries. From wood there are manufactured by chemical processes pulp, paper, fiber boards, textiles, cellulose wrappers, plastics, solvents, acids, tannin, preservatives, charcoal, oils for paints and as chemical solvents, and many other useful commodities.

Chemical utilization of forest trees is an important part of forestry and will undoubtedly increase in importance in the future. The theoretical or laboratory possibilities for further practical developments in chemical utilization are most promising. Much research is being done over the world in wood chemistry. Since chemical processes deal with the minute units of wood, the fibers, the colloidal particles, and the molecules, wood wastes should be ideally suited for utilization by chemical means. Some lumber companies and lumber associations are interested in the chemical development of by-products from their mill wastes and are surveying possible research programs. At least two companies in the West already have research laboratories and chemists working on waste utilization problems.

In the large and important field of preservation of lumber and timber products, a knowledge of chemistry is essential.

It is evident that chemistry is of vital importance to the specialist in utilization, even to the student who goes into commercial lumbering. The general forestry student does not need the detailed knowledge of a wood utilizationist, but he should have sufficient knowledge of chemistry to understand and appreciate the problems and new possibilities of utilization of the forest.

In forest research.—Practical forestry must build on research. In fact, research should always be ahead of practice for otherwise practice must move by rule of thumb, and such blind practice is frequently costly or even disastrous. Research is a large and important branch of the U. S. Forest Service, and many other institutions are carrying on technical and scientific forestry research. Such research, to be carried out intelligently, must be done by men with thorough training in their specialties and with broad fun-

[3]Offord, H. R. and R. P. d'Urbal. The use of chemicals in brush burning. Jour. Forestry 35:942-947. 1937.

damental training in the sciences basic to forestry, among which chemistry is important for reasons already given.

In forest management.—A knowledge of chemistry is no criterion for a successful forest manager. Nevertheless, a forest administrator who has a general understanding of chemistry is better able to appreciate and interpret certain data and problems with which he may have to deal than one who lacks this knowledge. He will be in a better position to understand and apply the results of research work to the practical management of his forest areas.

Nature of Training in Chemistry

The need for basic training in chemistry for foresters is apparent. However, there is considerable difference of opinion with respect to the nature and extent of chemistry courses necessary for foresters.

With the exception of certain specialized curricula, such as wood utilization, we cannot expect to teach more than the elements of chemistry. The usual requirement in most forestry schools is one year of general chemistry. In most cases, this general chemistry course is the same for all groups of students, i.e., foresters, engineers, science majors, and others. In principle, this is as it should be.

Foresters, after graduation, go into a diversity of jobs. In some of these jobs, the value of chemistry may not be immediately apparent. In others, particularly in research, a knowledge of chemistry at once becomes useful. Some graduates train to become specialists, either by self-study and experience or by graduate work. Therefore, the undergraduate work in chemistry must be such that it will give the general forest production student sufficient understanding of the subject for the intelligent practice of forestry, and will also enable him to build onto this work without loss of time if he later wishes to specialize. This means that if only one year of chemistry is required, as is usual, no more than the elements and basic principles can be taught, but these should be taught thoroughly. A special course for foresters, if it means a simplified course or a general survey or laymen's course, is undesirable and inadequate both in the subject matter taught and in the scientific methodology learned.

It is argued by some people that foresters do not need laboratory work or the detail covered in the usual freshman chemistry course, and that the course is organized essentially as a preparation for chemistry majors. Instead, this group urges a separate course with demonstrations in place of laboratory work and with less detail and more emphasis on the practical and everyday applications of chemistry. For nontechnical and nonscience students, such a course may be excellent, for it will give them an appreciation and a general understanding of how chemistry fits into the scheme of things. But it would teach little chemistry, little analytical and scientific methodology, and no experimental technique or manipulation. These things, and a good basic knowledge of the principles of chemistry and the chemical properties and reactions of the elements and compounds, are necessary preparation for sound courses in plant physiology, ecology, silviculture, forest soils, and wood utilization. Such a basic chemistry course need not overlook the teaching of practical applications and the relation of chemistry to human life and endeavor.

One year of chemistry is the barest minimum of preparation for a forester. Additional courses in analytical and organic chemistry are very desirable preparation for studies in physiology, ecology, forest soils, and silviculture. However, the forestry curriculum is already so crowded with essential material that it is impossible to include the standard second and third courses in chemistry, (analytical and organic). Furthermore, for the average forestry training, it is unnecessary and unwise to do so. A better arrangement would be to design a second year of chemistry for foresters to give them some understanding of analytical, organic, and plant chemistry. At the University of Idaho a second course of one semester duration was designed for agricultural students. It involves the elements of analytical and organic chemistry. Idaho forestry students now take this course. A half-year course in plant biochemistry should follow. Such an arrangement would extend and apply the fundamentals of the introductory course to the chemistry of the tree.

In discussing the deficiencies of forestry education, Graves and Guise[4] point out that the most significant criticism by those best qualified to form judgment is the lack of thoroughness in fundamentals. They also point out that many graduate foresters feel that their basic work was of little value. Analysis indicates that the trou-

[4]Graves, H. S. and C. H. Guise. *loc. cit.*

ble lies not in the inclusion of fundamentals and of the theory and principles of the subject, but it lies in the fact that the work was not thorough or the training was poor in quality, or the student himself failed to take advantage of the opportunities offered by the university.

Our introductory fundamental science courses are, unfortunately, frequently deserving of criticism. More unfortunately, this criticism often results in a weakening of the course by curtailing theoretical work and generalizing by teaching the subject as a survey course. A common fault in the teaching of introductory chemistry and physics is that in the attempt to cover the ground, a great mass of factual information is handed out. This is because these subjects have expanded greatly in recent years and the instructor fails properly to organize the material. The student, even a good one, may fail to assimilate it and his mental powers are certainly not stimulated. Warren K. Lewis[5] of the Department of Chemical Engineering, Massachusetts Institute of Technology, in discussing the education of engineers, points out that students who are trained in the above manner ". . . have grandiose concepts but cloudy notions of their relations to the facts. Many a graduate student, who will talk glibly of the third law of thermodynamics, is unable to give any idea of the nature of energy or the reasons for assuming its existence, or will define temperature as what the thermometer reads." In other words, as Lewis points out, the acceptance of any of the knowledge taught is an act of faith and not an intellectual appreciation of its background and meaning.

A course in chemistry—or in any science—should be so taught that the student grasps the logic of the development of the scientific laws and principles from the facts presented. The logical development of theories from known facts given the student teaches him not only the facts and theories and the limitations of the theories, but trains him to think logically along scientific lines. It develops analytical and creative thought which is important in meeting new problems in the profession.

[5]Lewis, W. K. Looking ahead in professional development. Chem. and Metall. Engin. 44:680-681. 1937.

A New Fire Equipment Manual

FIRE Fighting with Water is a new manual on water and portable pumper equipment, written by Gordon A. Rice and published by the Fire Fighting Equipment Division of the Pacific Marine Supply Company, Seattle, Wash. The booklet supplies considerable information on the use of portable gasoline pumps in forest fire control. It is clearly written and illustrated, and contains a wealth of useful data packed in its 72 pages. The manual sells for 50 cents, but may be obtained free upon request by readers of the JOURNAL OF FORESTRY. Please mention the JOURNAL when writing for your copy.

ECONOMIC AND COMMERCIAL POLICIES NECESSARY FOR SUCCESSFUL PRIVATE FORESTRY[1]

By CARL BAHR

California Redwood Association

The lumber industry is prepared to accept the ordinary risks of business, but the writer, actively interested in promoting private forestry, reports here that it is disturbed by such unnecessary risks as unfair, discriminatory, and unduly burdensome taxes; the inconsistency of public agencies in demanding forestry practices yet discouraging the use of the products these practices are intended to grow; and the unfair use of propaganda designed to discredit the industry. The recognition of hazards is the first step toward their removal. If private enterprises would recognize that it must do everything reasonably practical to advance private forestry and if the public agencies concerned with the forests would recognize equally that everything they say or do to create or stimulate insecurity and instability in forest industries is a backward step, private forestry, which has gone ahead despite man-made handicaps, would progress more rapidly.

THE topic assigned to me is pretty broad and my comments can only be general and superficial. The economic policies necessary for private forestry are in general not different from those necessary for the successful operation of any private enterprise. The differences are in details—important details, certainly—and in the practicability and possibility of doing things which ought to be done. Like all business, lumbering must plan for the future—it must constantly seek to eliminate waste, improve manufacturing processes, cut costs, carry on research work, and seek better and more stable markets. The important question, it seems to me, is what prevents these things from being done better and more rapidly.

Like human beings the first thing any business seeks to do is to keep alive. There is not much time for education, recreation, and provision for old age when there is an immediate food and shelter problem. And when the food and shelter problem has been met there is little disposition to put savings and capital in long-term hazardous investments if signs indicate the liquid assets may suddenly be needed to meet new and uncertain cost burdens.

Thus it seems to me that an abstract statement of economic policies necessary for private forestry overlooks the real problems. Private forestry is now being practiced to some extent; it will continue and it will improve—the real problem is "at what speed and to what extent?" And part of the answer to that question lies in the blunt statement that private enterprise cannot do those things necessary to speed up and to improve private forestry if the risks involved are definitely not good business risks.

Better utilization of forest resources, less waste in sawmills, and more efficient distribution are essential. Certainly lumbermen are constantly seeking to lower costs through efficiency, to improve markets through more intelligent selling, and to improve competitive conditions in every possible way. Some whose foresight and willingness to gamble is greater than the average are extending themselves in research, the development of new products, and the search for new uses for the product of the forests. But by and large, when the point has been reached at which substantial, long-term and fixed investments are required, they are not forthcoming. This is a real problem. Why does progress stop here, and what can be done to improve the situation?

That question, it seems to me, first involves consideration of business hazards or risks. Hazards attend the operation of all business enterprise. There are first of all the ordinary risks of any business. Every decision made by a business man involves some sort of risk, and when it relates to general policy which may steer or change the course of the enterprise over a period of future time, the risk is correspondingly greater. There is the risk of change in consumptive demand, the development of new competition, strikes, wars, and various acts of God. There is the risk of more efficient competition.

No business is immune from such risks. Our profit system is based on the principle that profits should accrue in proportion to the risks taken. Certainly no one would seriously contend that private forest enterprise should be protected from normal and ordinary risks of business as long as we operate under our present political and eco-

[1]Presented at annual meeting of California Section, Society of American Foresters, at San Francisco, Calif., January 6, 1939.

nomic system. And when we speak of the hazards of long-term investments in forest enterprise, we are not including such risks.

The second class of hazards or risks differs primarily in degree from those of the first class. Here we may note such risks as the great period of time over which a forest investment must be liquidated, its inflexibility, the difficulty of converting it promptly into cash, its unattractiveness at the present time as compared with investments in many other types of business enterprise, the unlikelihood of large profits, and the definite downward trend in the consumption of lumber and other forest products.

These are also straight business risks. Their cumulative effect is obviously to warn managers and investors that forest enterprise does not offer the attractice opportunities of other lines of business. There is therefore a tendency for capital to avoid investment in forest enterprise, and for managerial ability to seek other and more promising outlets. I believe these factors are sufficiently important to justify special consideration of the problems of private forestry by public agencies. That does not imply bounties or special relief from the federal treasury; but it does include such things as consideration of the tax problem and its effect on private forestry, special research on forestry problems and on forest products, and perhaps some form of marketing assistance.

Some of these things have been done. The work of the Forest Products Laboratory and the experiment stations particularly may be noted. A considerable sum of money was spent by the U. S. Forest Service in a study of the tax problem. These are certainly steps in the right direction. But it may be well to note that the problems have not been solved until the answers are known and are put into practical operation. Part of that job rests on the industry but a part also rests on the public agencies. When public agencies devise practical means for improving forest utilization, industry certainly should welcome the opportunity to use the results. But when public agencies determine that our tax system requires revision to secure fair treatment of forest operations, the burden may still remain with them to see that something is done about it.

In dealing with this class of hazard it seems to me that the policy should not be that of placing private enterprise under state ownership or state control. It should rather be one of giving such assistance, guidance, and other aid as will preserve intact the principle of private enterprise, permit efficiency and economy still to determine survival in business, and to seek to retain the free play of competitive forces so that those with ability and ingenuity will continue to receive the rewards of their success.

The third category of hazards or risks is to my mind by far the most important. It moreover involves a kind of hazard or risk which is wholly unnecessary, but because it deals with human nature, very difficult to control.

Perhaps some examples will serve to make this point more clear.

The tax risk is not only one of higher taxes. It is the risk of unfair, discriminatory, and unduly burdensome taxes. The trend has been in that direction. In California we are faced with the prospect of severance taxes, apparently sought not because the present tax burden on forests is inequitable and a fairer method should be substituted, but because the needs of the state for revenue are great, and perhaps because heavier taxes on natural resources are politically expedient. Apparently the theory is that the public good is so paramount that it justifies unfair treatment of the selected few called upon to bear additional tax burdens. It is the doctrine, in a very mild form, of the dictatorships. We may put a question at this point. How much would you be willing to invest in forest enterprise in face of the fact that its tax burden is not only increasing but that the tendency seems to be to impose unfair burdens of taxation?

Furthermore, forests have values other than those of producing forest products: erosion control, grazing, and social and recreation values. These are real values, but what is the basis of the reasoning by which the cost of the creation, maintenance, and improvement of these values are charged to the lumberman?

Let me ask here, how much would you invest in forest enterprise in the face of constant pressure suggesting that the enterprise may be called upon to contribute in unknown amounts and according to no fixed policy for recreation, erosion control, and all these things we can bulk under the head of "social values"? I am not sure that anyone has specifically proposed that, but I am sure that the inference may clearly be drawn from some of the muddy and confused talk on the subject of private forestry and the failure of

private enterprise to deal properly with their forest properties.

In private enterprise, costs of operation must be met from proceeds secured by the sale of products. Markets therefore are matters of direct concern determining ability to practice forestry. It would therefore seem that public agencies would be among the first to encourage the use of forest products. Yet we have instances of the Forest Service purchasing steel for uses to which lumber is eminently suited, and for which it can be purchased at more attractive prices. The important point here is not the volume of business lost from such sales. It is the inconsistency of policy which apparently tears down with one hand which it tries to build with the other.

Consideration must also be given to propaganda, using that term in its real sense of education. It is a powerful weapon. It is capable of great abuse as well as of great good. Its powers frequently are developed by emotional approaches and emotional controls. Many of us believe that a great part of the forestry sentiment in this country is lodged in groups who have little appreciation and little interest in the real practical problems which must be solved before private forestry can be made successful. Without questioning the desirability of creating and maintaining a broad interest in forestry, many of us question whether that interest is always used sanely and wisely by those who have fostered it. It is a very real hazard for a private enterprise to know that there exists a body of public opinion which can be swayed to the disadvantage of that enterprise at the will of a group which may not be interested in the success of private enterprise, or is ill-informed of the practical problems which that enterprise may encounter, or believes that its purposes are of such public importance that the interests of the private enterprise can be ignored. How much would you be willing to invest in private forestry, knowing that there exists a vast and influential body of public sentiment which unthinkingly holds that conservation is cold storage and is willing to battle for that principle?

I firmly believe that hazards such as these exercise a profound influence on the development of private forestry. They are hazards which cannot be measured because they are constantly shifting and uncontrolled. There is no insurance against them. They strike directly at the most fundamental necessities for sound business operation, security, and long sustained stability. It may be argued that it is the attitude of private forest enterprise toward the problems of private forestry which has created these hazards, and that it is up to private enterprise to give evidence of good faith before they can be removed. It is not my purpose to argue that point here. It seems to me sufficient to say now that general recognition of these hazards is the first step toward their removal. If private forest enterprise could begin by recognizing that it must do everything reasonable and practical to advance the cause of private forestry, and if public agencies concerned with the forests would recognize equally that everything they say or do to create or stimulate insecurity and instability in forest industries is a backward step, I think we will have made real progress.

In presenting this paper I am mindful that one might conclude that the hazards in private forestry are so great that the answer must lie in another direction—possibly in public ownership, or at least a greater measure of public control. I do not think so. I still believe in private enterprise, even in the forests, and I think that the same economic system under which this country was begun and has developed will provide the best means of getting the best out of the forests for all the people of the United States. Even in Europe, where business is generally less free than in this country, it is forest security and stability—the stability of forest values and the stability of all other things which permit an enterprise to move along on an even keel—which has made private forestry successful. It has not been done by restrictions which have discouraged investment, made values uncertain, destroyed equality of opportunity, and created adverse competition conditions. Nor do I think that advocates of public ownership or control may point to these hazards as arguments favoring their views. To a considerable extent they are responsible for the development of this feeling of insecurity and instability. It does not seem quite fair that a group which works to prevent the rapid and successful development of private forestry should urge that as a reason for the adoption of their views.

I firmly believe that private forestry will develop here and that it can be made a practical business enterprise. Some forestry is already being practiced. Real substantial progress has cer-

tainly been made in the last ten years even in the face of what may appear to be the discouraging picture that I have painted. Even under present conditions private forestry will expand and improve. If many of these unnecessary hazards and risks can be removed, its progress will certainly be more rapid and more satisfactory. The task of bringing this about calls for the joint efforts both of the public and the forest products industries. That can best be secured by more understanding on the part of both groups by less suspicion, less pessimism, less fault finding, and by more friendly relationships, with the appreciation that in both cases the interests are the same. The forest products industries and the public both find their objective in an assured future for American forests; it is only incidental that one group sees this as the raw material for commerce, and the other from the point of view of social objectives.

DR. A. B. HATCH, a Junior member of the Society, was appointed on March 13 as first director of Idaho's new nonpolitical State Fish and Game Department, with an annual budget of approximately a quarter of a million dollars, plus Pittman-Robertson funds, and a free hand to plan and administer a constructive program of wildlife management for the state. Selection of subordinate personnel will be on a merit basis following examinations.

Dr. Hatch's appointment is the first fruit of a growing dissatisfaction with the former inefficient political-appointment system which culminated at last November's election in the passage of a popular initiative measure requiring the governor to appoint a five-man, rotating, nonpartisan State Fish and Game Commission charged with selection of a director for the new department and supervision of its policies and activities. The popular demand for this move was indicated by 12,000 more votes cast for the initiative measure than for the successful governor. The new law is believed by its sponsors to be more liberal and to provide a better basis for executive action than any in the nation.

At the time of his appointment, Dr. Hatch was a member of the staff of the Idaho School of Forestry.

THE importance to the national life of Mexico of forests and forestry was recognized by President Lazaro Cardenas early in his administration. Under the able and far-sighted leadership of Dr. Miguel A. de Quevedo, there was set up in 1935 a Department of Forests, Game, and Fish. A new department was organized and set to work. A new impetus has been given to forest research and forestry education. National forests and parks are being created. As a further evidence of forestry progress in Mexico, eight new local forest nurseries have been established throughout the Republic with a capacity of one and a half million trees annually, in addition to three central nurseries and two regional nurseries with capacities of one million trees. Tree planting, forest extension, and a campaign against forest fires are going ahead actively. —*Protection a la Naturaleza.* January 1939. Mexico, D.F.

A SOIL BORING TOOL FOR FROST DEPTH DETERMINATION

By B. C. GOODELL

Central States Forest Experiment Station

Measurements of depth of soil freezing are of importance in any complete consideration of vegetational influence on surface run-off. They provide a means of evaluating the relative effectiveness of vegetation in reducing or preventing soil freezing with resultant high run-off rates. To date there has been developed no satisfactory means of measuring depth of soil freezing on the scale required for adequate sampling. The following article describes a tool and method which, with development to suit particular edaphic and climatic conditions, is believed to promise such a satisfactory means.

IN PREVIOUS studies of soil freezing there have been two methods used for determining frozen depth. One method, the most common, has been to expose a profile of the frozen soil by means of pick and shovel and measure the frozen layer. The other way has been the approximating of frozen depth by means of soil temperature taken at several levels and determination of the 32-degree F. level by interpolation.

Both methods have disadvantages which seriously handicap the gathering of extensive data on soil freezing. The first procedure is impractical, except for very limited use, because of the laborious, time-consuming work involved and the soil disturbance resulting. The second method, besides requiring expensive equipment for any extensive series of measurements, is based on the assumption that soil freezes at 32° F., an assumption which probably is seldom strictly true.[1,2]

The instrument described, while not sufficiently developed to be completely satisfactory as a device for frozen depth determination, makes possible such an improvement over previous methods that publication of its description is warranted. It may find considerable use in view of the current interest in soil freezing as a factor affecting surface run-off.

The device was first developed by the writer at the Harvard Forest, Petersham, Mass. It has since been improved at the Central States Forest Experiment Station for use in a study of soil freezing in southern Illinois.

The appearance of the tool is shown in Figure 1 and the specifications and details of con-

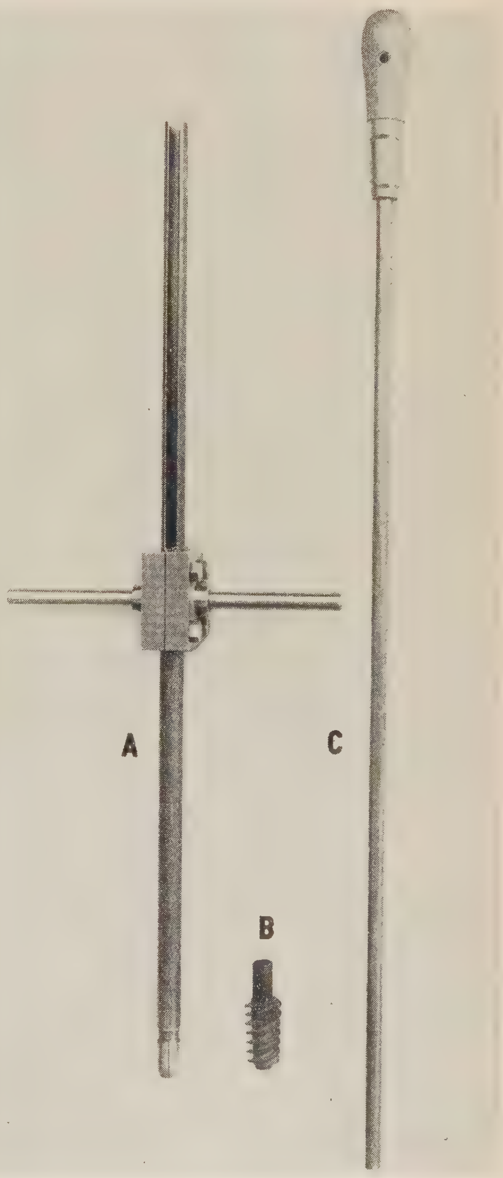

Fig. 1.—*A*, Soil boring tool with cutting tip partly unscrewed to show removable feature; *B*, Screw type cutting tip, as yet untested; *C*, Ramrod for use in moving soil cores within stem of tool.

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[1]Pearson, G. A. Factors controlling the distribution of forest types. Part II. Ecology 1:289-308. 1920.

[2]Rutledge, P. C. Report on investigations on frost action in soils and in natural and artificial building stones. Internatl. Conf. Soil Mech. and Found. Engin. Proc. 2:260-262. 1935.

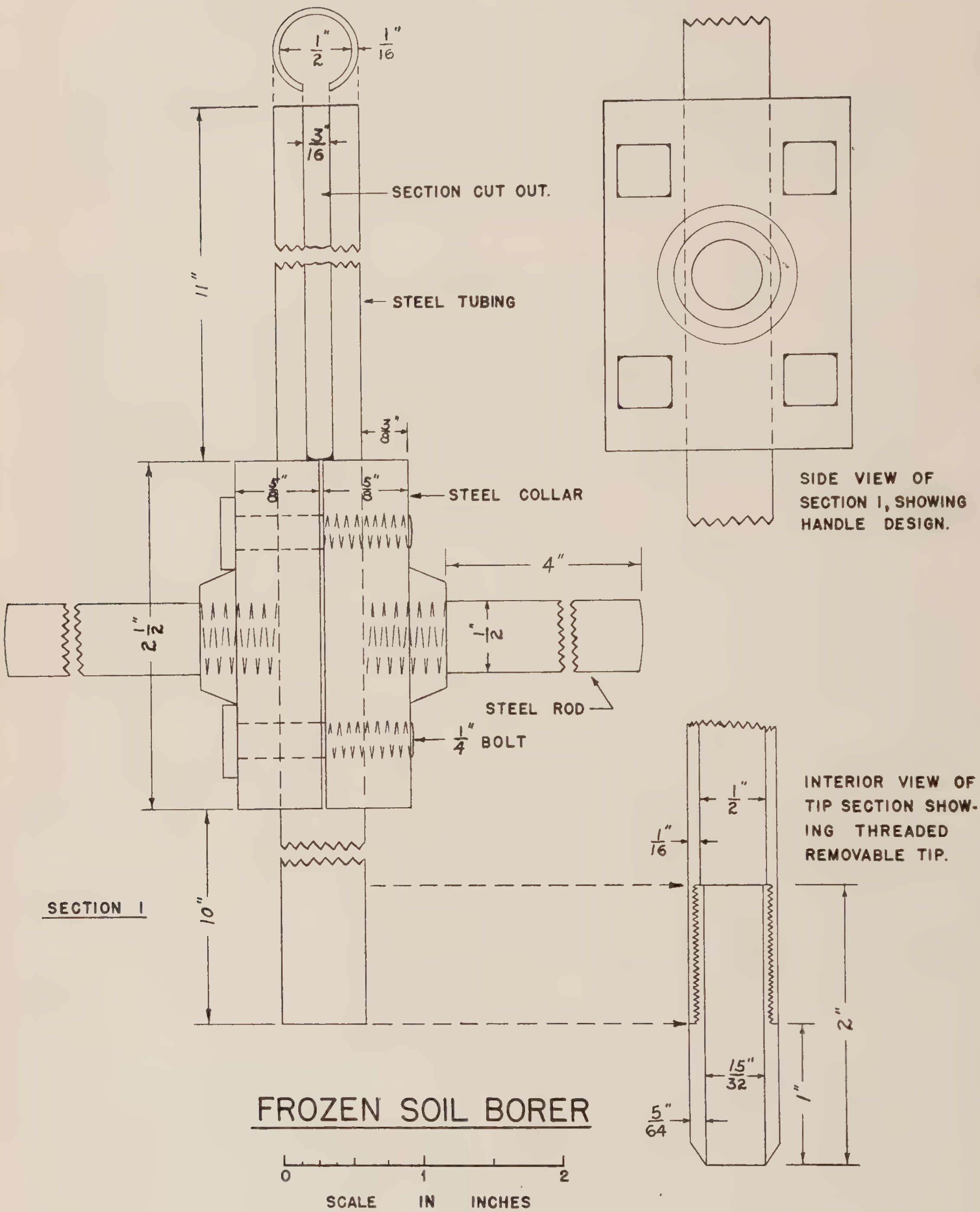

Fig. 2.—Plan and specifications of frost boring tool.

struction in Figure 2. The dimensions as given are suitable where not over 11 inches of frozen depth is to be encountered, but they can be altered to meet other conditions. The stock for the stem is common, seamless, steel tubing. The cutting tip, which is threaded to the stem, is of chrome-molybdenum steel for toughness and long-wearing quality. The removable nature of the tip provides for the occasional replacement necessary when stony soils are sampled.

In use, the cutting end of the tool is forced down through the frozen soil by means of pressure and a twisting movement applied to the handles until the underlying, unfrozen soil is penetrated; the sudden lessening of resistance making this point readily felt. The tool is then withdrawn and the core of soil pushed upward into the slotted section of the tubing by means of the ramrod. The core may then be examined, the frozen portion separated from the unfrozen and its length measured.

Measurements by this method can be taken rapidly and, while somewhat laborious, are much less so than when taken on pit profiles. The time and labor involved depend, of course, on the depth of freezing encountered. In addition to the labor-saving advantages, soil disturbance is of such slight extent that many measurements can be made over a small area and an average for the area so obtained. Very stony soils present difficulties to the use of the tool, sometimes making several borings necessary before the lower limit of freeze can be reached. This procedure results in measurements which are not truly random samples. The same handicap is encountered, however, in any other method of sampling stony soils. Soft or thin rock fragments can frequently be penetrated by the instrument.

The cost of construction of these tools should not be great when a number is wanted. Those which the writer had constructed cost about $12 each, of which about $1.50 was for stock and $10.50 for labor, paid for at the rate of $1.50 per hour. This labor cost would have been reduced had more instruments of identical pattern been ordered.

When the instrument was designed, the intention was that it would be suitable for use under all conditions of soil composition and weather severity. However, it is now realized that advantages would result from modifying the design to fit particular conditions of soil and climate. The smaller inside diameter for the cutting tip (Fig. 2) was incorporated to facilitate use in very cold weather. Without this feature, when borings are attempted in weather of near zero temperatures, the core will frequently freeze to the inner walls of the stem and make further progress impossible.

For use in regions where soil sampling in such weather is not necessary, a uniform inside cross section is an advantage since it enables the removal of the core from either end of the tool. Under conditions of moderately severe weather and stone-free soils such as prevail in southern Illinois, Sutton[3] recommends a tool with uniform inside diameter and with the slot opening for examination purposes extending down from the handle to and through the cutting tip. This last feature would make unnecessary the pushing upward of the soil core for inspection and the portion of stem above the handles could be eliminated.

Figure 1 *B* shows a type of cutting tip which has not been thoroughly tested, but it is believed that this screw-type tip will work satisfactorily in at least the stone-free soils of fine texture and will make for much easier penetration. Several other proposed improvements will be tried out.

[3]Sutton, C. E., superintendent, Southern Illinois Branch, Central States Forest Experiment Station.

COUNTY LAND USE PLANNING

By K. E. BARRACLOUGH
Extension Forester, New Hampshire

The U. S. Department of Agriculture's program of county land use planning is one that is little understood by foresters generally. The results and their application to land utilization may vitally affect the trend of forest policy, not only as regards farm woodlands but public forests and public regulation of private forest management as well. The author briefly describes the program and indicates how it may function to obtain better coordination of public forestry activities.

THE U. S. Department of Agriculture has been reorganized for the purpose of giving more efficient service to the rural people of the nation. Numerous bureaus and services have grown up within the Department without much planning or thought of coordination. This lack of coordinated growth often has resulted in confusion and misunderstanding in the field by the rural people and even between the various agencies of the Department. Also, it is being recognized more and more by the administrators within the Department that this huge federal agency can easily become bureaucratic in character. Along with the reorganization of the Department of Agriculture, a plan is being developed whereby rural people are to have full authority to study their own rural problems, especially as these problems relate to the economic stability of the individual, the community, the state, and the nation. As a result of such study they will have the opportunity to formulate plans for the best use of the land as it affects the economic welfare of the individual, and the local, state, and federal government. With the gradual development of a land use policy by the rural people, the reorganized Department of Agriculture will continue to make adjustments. State agencies concerned with problems of land use planning also will need to make adjustments, if they are to cooperate in carrying out recommendations that may be suggested by county land use planning committees.

In order to avoid the difficulties that always result when a new program moves too rapidly, a tentative procedure has been set up for developing one unified county program in each state for 1940. In the outline of the procedure the purpose is stated as follows.

"To develop an integrated agricultural land use, conservation, adjustment, and rehabilitation program in a selected county in each state, based upon a direct analysis of the agricultural problems in the selected county and worked out through the joint efforts of farmers and representatives of the state agricultural colleges, other state agencies, Bureau of Agricultural Economics, and the various administrative and educational agencies of the Department of Agriculture." Specifically, it is desired:—

"1. To encourage farmer participation in planning and developing agricultural programs in cooperation with representatives of the state colleges, other state agencies, and the Department;

"2. To work out the land use adjustments and changes in farming systems, practices, and institutions which best meet the conditions and problems existing in the county.

"3. To revise and coordinate the several programs so as best to achieve or move toward the desired adjustment outlined under 2."

The Extension Service, as a result of the Mt. Weather agreement, has been made responsible for establishing an organization to formulate community, county, and state land use plans. On any community, or county, or state land use planning committee, the majority of the members are farmers, and the chairman of a community and a county committee is a farmer member. In counties where forestry is a problem, woodland owners are represented on the committee. Public representatives on a committee consist of representatives of the Soil Conservation Service, Farm Security Administration, Farm Credit Administration, U. S. Forest Service, and others, if they are concerned with land use problems in an area where a county or state land use committee is functioning. Also representatives of state agencies concerned with land use problems are represented on these committees. The Director of Extension is chairman of the state land use planning committee. The representatives of the public agencies serving on land use planning committees should be considered as technicians who supply the farmer members with facts concerning land use problems so that they, the farmer mem-

bers, are in a position to make sound recommendations in the building of a land use plan.

Under no circumstances should the representatives of the public agencies act as pressure groups. On this point the entire program of land use planning by the rural people themselves is most apt to fail. In short, the plan of procedure is to have the rural people formulate their own agricultural land use program, starting on the individual farm and in the community. Community land use plans are to be coordinated by the county committee to make up a county land use plan, and the county land use plans are to be coordinated by the state committee to make up a state land use plan; and in time the state plan will be coordinated to formulate a national land use plan. The entire plan for program building is based on the assumption that if rural people are given the opportunity to study land use problems as they concern the individual, the community, the state, and the nation, they can be depended upon to formulate a program of land use that will be sound and in the best interests of all the people.

The Extension Service is confronted with a difficult task. Extension workers must be educated to undertake the assignment from a broad point of view rather than along the lines of project teaching where a farmer is persuaded to build a silo or to go into commercial potato production because the county agent happens to be interested in these projects. We are past the period when we can teach farmers new and better methods of production and then assume that they can carry on successfully from this point as individualists without regard to the many social and economic problems that have developed from the misuse of land. It is the job of the Extension Service to teach the people to work together in the solution of their mutual problems. It has the responsibility of teaching rural people to make the best use of the public services that they, the people, have created. Good relations must be maintained with all public agencies concerned with land use problems. There is no set procedure as to how the program is to be carried out. General rules have been established that are applicable to the entire country. Each state and each county will go at the job differently, but every effort will be made to hold each community, county, and state group to the general objectives.

What can we expect rural people to accomplish by land use planning? This can perhaps be answered by quoting a few examples where land use planning has been tried. In the State of Vermont, rural people as a result of county land use planning meetings, have recommended that, in the case of poor lands where owners have failed to pay their taxes, these lands be turned over to the towns for the purpose of developing town forests. The committees plan to ask the government to assist the local people to secure funds so that local unemployed labor may be used in developing the areas for town forests.

In Coos County, Ore., the County Land Use Planning Committee has made the following recommendation: that some 16,000 acres of bottom land in the county be converted into farm land and the farmers now located at the heads of several nonproductive valleys far from market be moved onto this newly developed bottom land; of the two million acres of cutover forest land in the county about 300,000 acres should be put into grass and increase the number of dairy cows and sheep. As a result of this type of land planning, the Oregon State Legislature has already passed some necessary land legislation.

Through county land use planning in the State of Wisconsin, excellent progress has been made in the rural zoning of land.

County land use committees may make some very interesting recommendations after the study the facts. I can visualize where they might find it desirable to recommend better coordination of public activities in a county. It is quite possible that they might recommend public regulation over privately owned forest lands. When a demand for regulation is made by the people back on the land, it is more liable to be favorably received than when the people are subjected to regulation without a voice in the formation of the policy.

If county land use planning is to succeed, progress will be slow and deliberate. The program should go ahead only as fast as the majority of the people understand the problems and feel the need of doing something about them. The progress of the thinking of the people on land use planning depends upon the ability of trained workers to educate and organize rural people so that they will act on their own initiative. It must be remembered that it has taken us over two hundred years to get into this mess resulting from improper land use, and we will not solve the problem in a few days.

SOME ECOLOGICAL ASPECTS OF FOREST GENETICS[1]

By ERNST J. SCHREINER

Northeastern Forest Experiment Station

In some respects the subject of forest genetics is like the subject of weather. Both are much discussed, but little is done concerning either. Although the author approaches the subject of the relationship between forest genetics and forest ecology from the point of view of the ecological aspects of forest genetics, it might be equally well approached from the point of view of the genetical aspects of forest ecology. In either case it would probably lead to the general conclusion of the author that at present the practical objective of both forest genetics and forest ecology is that the best forest tree types be fitted into favorable habitats.

THE forest geneticist and the forest ecologist are both interested in the similarities and differences between forests, between stands, and between individual trees. The geneticist thinks of these similarities or differences in terms of inheritance; the ecologist, in terms of habitat. The individual forest tree is the end product of the reaction of a particular genotype over a long period of years to a changing complex of environmental conditions. Therefore, the development of the tree must be explained in terms of both heredity and environment. The problem of the forest geneticist is to find the trees with the best genetical constitution, the best genotypes—and to produce still better ones. The problem of the forest ecologist is to determine the effect of environment upon the genotype.

Work in forest genetics may be conveniently discussed under three general headings: (1) Seed origin; (2) Individual seed tree progeny tests; (3) Hybridization and selective breeding. The successful solution of many problems in each of these fields of activity will require an understanding of the ecological factors affecting the individual.

Seed Origin

Briefly stated, the problem of seed origin involves the discovery of the climatic or physiological races that will grow best in various regions or localities. It is a generally accepted fact that most, if not all, forest species consist of races or strains which have developed under specific environments. Early forest planting in Europe has demonstrated that seed collected in one region may, in some other climatic division within the natural range of the species, produce trees which from the standpoint of the forester are total failures. The introduced strains may fail to survive; they may become decadent early in life; they may develop poor timber form; they may be susceptible to climatic extremes; in short, the reaction of the genotype to the new environment may be partially or entirely unsatisfactory. The reverse may also be true: some races may grow better in a new environment.

The final solution to this problem rests upon the establishment of test plantations of seedlings from various seed sources; but the establishment and subsequent study of extensively replicated seed-origin plots is expensive, and it is obviously necessary to limit the number of strains to be tested. The selection of strains for test planting in particular localities should be based upon a knowledge of the ecological factors operating both in the place of origin and in the planting locality.

Individual Seed Tree Progeny Tests

As in any mixed population of living organisms, individual trees in the forest exhibit considerable variation. Differences have been observed in such forest characteristics as rate of growth, branching habit, persistence of branches, form of bole, and resistance to disease, insects, and climatic extremes. Variations have also been reported in use characteristics, such as wood quality, chemical and physical characteristics of the wood and of the fibers, and yield of resin. Excellent individuals are the basis for improvement of our forest trees, either by mass selection in the natural forest or by selective breeding and hybridization. Such outstanding individual trees offer a twofold problem. First, it is necessary to determine whether or not the desirable qualities or characteristics are inherent; and second, it is necessary to determine the mode of inheritance of these qualities.

The genetical approach to this problem is the

[1]Presented at the joint meeting of the Ecological Society and the Society of American Foresters, Indianapolis, December 28, 1937.

so-called "progeny test." This involves control of the male and female parents, followed by a study of the progeny derived from such controlled breeding from the nursery to maturity of the stand. The difficulties of controlled breeding with forest trees have led to the use of what may be called one-parent progeny tests. Open pollinated seed is collected from selected mother trees; the male parentage is unknown. Progeny tests are necessary for a complete understanding of inheritance and the mode of inheritance. Although certain characteristics may be tested early in the life of the individual as, for example, vigor, resistance to disease, and climatic conditions, many of the more important characteristics from the standpoint of utilization, such as quality of lumber and the chemical and physical properties of the wood, should be determined from mature specimens. Since such tests are expensive and of long duration, it will be impossible to test all apparently excellent trees that will be discovered in the forest; hence the necessity for selecting parent trees on the basis of ecological considerations to eliminate individuals whose excellent characteristics or qualities are probably the result of a particularly favorable habitat.

The ecological approach to this problem would consist in stripping the mask of environment from the individual. Although this would not establish the mode of inheritance in wildings whose parents are unknown, it would indicate heritable differences between individuals.

Information on the reaction of the genotype to environment is also required for the practical application of the data derived from progeny tests as, for example, the application of genetical mass selection to forest stands that will never be clear-cut and replanted. The silviculturist marking a stand for thinning, weeding, or commercial cutting must have criteria of inherent excellence for the evaluation of individual trees which are to be left as the progenitors of the future forests. Such criteria should be described in terms of the tree's environment.

Hybridization and Selective Breeding

The practical aim of both hybridization and selective breeding is the creation of new types with one or more particularly desirable characteristics. The breeder is attempting to produce a tree that will respond in a desirable or profitable manner to its environment. Consciously or unconsciously, he has in mind the environment under which the ideal tree is to be grown. Ecological consideration must therefore enter into the delineation of the ideal tree even before the search for parent species or parent individuals is begun. The selection of parent trees for hybridization and selective breeding should be given the same ecological consideration as the selection of parent trees for progeny tests.

Selection of the progeny derived from controlled breeding of forest trees usually requires an accurate evaluation of the effect of environmental factors. Agricultural plants, annuals or biennials, can be tested under fairly uniform conditions and with comparatively close spacing. Forest trees must be planted at least 6 by 6 feet apart, about 1,200 trees per acre, and must occupy the area for many years. The acreage involved in extensive selection tests with forest trees, therefore, becomes a major consideration. It is often necessary to establish the selection plantation on areas that present differences not only in physiographic and edaphic conditions, but also in the volunteer plant associations which gradually take over the area. The successful selection of the best individuals in such plantations is dependent upon the accurate interpretation of the effect of environmental factors which have modified their development.

Some trees may be so outstanding that there is little difficulty in recognizing their inherent value. On the other hand, poorly developed trees growing under adverse conditions may be excellent genotypes, and the influence of environmental factors, individually and in the aggregate, must be considered for their proper evaluation. Although competition can be controlled to some extent by weeding annually during the early years of the plantation, after the second or third year, if breeding work continues and more plantations are established, this may become impossible and probably even undesirable. After the progeny is satisfactorily established on a site, it seems best to permit natural competition and natural selection to eliminate the trees that are not adapted to forest planting. This procedure may, of course, result in the loss of some good or even excellent individuals.

An Example of Some Ecological Aspects of Selection and Inheritance Studies with Poplars

The ecological aspects of selection and inheritance studies with forest trees can be specifically illustrated by the work now under way at the

Northeastern Forest Experiment Station with the Oxford hybrid poplars. The Oxford Paper Company, in cooperation with The New York Botanical Garden, started a project for the hybridization and breeding of poplars in 1924. Approximately 13,000 hybrids were produced, and of this number about 700 2-year-old seedlings were originally selected for intensive study. The remaining hybrid seedlings were planted 6 by 6 feet apart in forest plantations in Oxford County, Maine, in 1927 and 1928. The planting site was pasture land abandoned some 50 years ago, from which an uneven-aged stand of hardwood was cleared previous to planting. The plantations were weeded during the first two years, and at the end of the second year the hybrids had become established with practically 100 percent survival.

For the reëvaluation of these hybrids it has been considered necessary to make a topographic map with 1-foot contour intervals showing the location of the individual seedlings and the plant communities of which they are members. The height growth of fire cherry and of trembling aspen, which were found separately or in combination in all communities, was used as an aid in the classification of site quality. It should here be noted that it would have been highly desirable to have planted genetically identical individuals of a poplar clone throughout the plantations. Such trees spaced at 50-foot or 100-foot intervals would have given a more accurate measure of site quality.

The following is a brief summarization of the plant communities recognized on these plantations: (1) *Grassland*, with heavy sod. Growth of the poplars was poor, and survival was comparatively low on the heavily sodded areas. (2) *Fern and berry bush*, with a lighter sod and a dense stand of fern, raspberry, and blackberry. This is apparently intermediate between the grassland (No. 1) and the mixed hardwood (No. 6). The growth of hybrid poplars was somewhat better than on No. 1. (3) *Raspberry thickets*, practically pure clumps of raspberry varying in height from 3 to 4 feet, covered small areas of the plantations. (4) *A hawthorne thicket*, comparatively small in area, was recognized because of its density. (5) *Alder thickets*, consisting of practically pure alder, occurred on sites that were wet during most of the growing season. The stand was very dense, and growth and survival of the hybrids were very poor. Even on these sites, however, there were exceptional hybrid individuals which were growing vigorously and were in excellent condition. (6) *The mixed hardwood* community consisted of a sprout mixture of birch, beech, maple, and aspen, with considerable seedling fire cherry. The hybrid poplars reached their best development in this association. (7) *A pure stand of hybrids* was also recognized. This probably owed its origin to the fact that a uniformly vigorous hybrid progeny overtopped and suppressed the volunteer hardwood early in the life of the plantation.

Selection and inheritance studies have involved the collection of data on the following characteristics for each individual hybrid in these plantations: survival, d.b.h., total height, crown class, forking, branchiness, branch angle, branch curvature, crown size, number of water sprouts, occurrence of fungus cankers, resistance to leaf rust (*Melampsora*), and borer injury. It is clear that most of these data must certainly be considered in the light of the ecological factors which have influenced the growth of each individual hybrid.

In conclusion, it may be said that although the effect of environment upon the germ plasm itself may eventually become of great significance, at the present time the reaction of the genotype to the environment is of primary importance. For the present, a practical objective of both forest genetics and forest ecology may be briefly defined as the best forest tree types fitted into favorable habitats. The forest geneticist's responsibility is to discover, or to produce, inherently superior races, strains, or types. Since the habitat modifies many expressions of heredity, especially such characteristics as rate of growth, crown form, and persistence of limbs, the extent of such modification must be considered in judging the inherent value of a species, race, or individual. It is the responsibility of the forest ecologist to determine the effect of habitat on the expression of characteristics which are basically inherent. Thus, genetical and ecological efforts may well be coordinated toward the end in view —better forest trees.

WHAT WOODS PRACTICES ARE NECESSARY FOR THE DEVELOPMENT OF PRIVATE FORESTRY?[1]

By CLYDE S. MARTIN
Western Pine Association

Development of private forestry depends entirely on economic factors. The desirability of sustained-yield operation is recognized by the operators, but the obstacles to its effectuation seem insuperable. The author, one of the most experienced foresters in private employ, believes if the operator is given real public cooperation in the adjustment of tax burdens to a cropping basis of valuation; in controlling spread of destructive insects and diseases; in sharing the cost of fire control on a basis of responsibility and actual benefit; and in a genuine effort to improve existing economic conditions to the point that private forest management may reasonably be expected to return a profit comparable at least to that expected from other conservative investments, then without question the lumber industry will not only progressively improve its woods practices but will devote its best energies to developing the highest possible type of forest management.

To me this topic is putting the cart before the horse, as good woods practices in themselves have little to do with developing private forestry. It is true that forest management implies that methods employed in harvesting the timber crop be such as will insure a new crop in the shortest possible time, which in turn means protection against damage to reserve trees and seedlings and the control of fire and other forest enemies. But the development of private forestry depends entirely on those economic factors which affect the balance between costs and revenues to the extent that they may be measurably controlled through efficient management.

This is a fact that has been lost sight of by many of the proponents of legislative regulation as a means of securing good forest management. Others understand the situation perfectly and encourage the idea of regulation because they believe that only by subsidized government ownership of forest lands can adequate forest management be assured. They realize that by accelerating the breakdown of private enterprise a planned socialistic economy will be hastened.

I take it, however, that the intent in assigning this topic to me was not to discuss regulation or theories of government, but that you are very much interested in the industry's viewpoint on the effectiveness of voluntarily accepted forest practice procedure in leaving forest lands in such condition that they may be placed under management without long delays and the excessive costs involved in bringing them back to a normal productive condition. You wish to know whether present forest practice on private lands can be improved and how rapidly such improvement may be expected.

In order to answer these question frankly and to the point, I will first analyze industry viewpoints as I interpret them, after a number of years spent studying the problems now confronting our western pine operators. The lumber industry is not an entity and never will be. It is a vast and scattered number of individuals and companies with as many viewpoints as there are individuals, each thinking of general problems largely as they affect the conditions he himself is facing. So no one person can adequately speak for the industry. One can only express his own opinions on the general trend of industry thought as shown by the gradual changes in policy now taking place. Therefore, these are the views of Clyde Martin, forester, and may differ radically from those held individually by many members of the industry.

Lumbermen have adopted definite and standardized minimum forest practices; first, because they believe it to be good business to provide concrete objectives for each operation to work towards; and, second, to record their convictions concerning practical measures which will keep their forest lands productive. They sincerely believe that they owe this to the public welfare in order to provide future sources of raw material for the use of industry. They believe that stable industry is the only basis on which our present economy can survive, and, therefore, that our natural resources should be conserved and used wisely with a minimum of waste. The corner stone of such a philosophy is to provide forest protection from mechanical damage and fire. We have not yet demonstrated in this country that effective protection against insects and

[1]Presented at annual meeting of the California Section, Society of American Foresters, San Francisco, Calif., January 6, 1939.

disease can be assured at a cost that will not make the carrying charges on reforesting lands exceed the values which may be eventually derived from them.

These forest practice measures have resulted in reasonably adequate fire protection in the western pine region. From 1934 to 1937 inclusive, the period during which our forest practice rules have been in effect, in protecting 2,271,201 acres of recent cutover lands for which the operator is primarily responsible, only 6,656 acres per year have been burned over by uncontrolled fires. This is 3/10 of one percent of the area protected. The direct cost of this protection to the industry has exceeded $1,000,000 annually.

Reserve stands and seed trees left on cutover lands are gradually increasing and the observance of adequate diameter limits is improving, as is attested by the surveys of cutover lands made by the U. S. Forest Service in Region 5 covering 1936 and 1937 cuttings. We have only recently instituted systematic surveys of our own to measure the progress being made, but we expect to have reliable data available some time next year and from then on annually.

Protection of immature trees and young growth from logging damage has been less successful than other measures adopted by the industry, although there are a few notable exceptions. The reason for this is apparent to close observers. It is because no general progress can be made in this direction until we challenge the interest of the loggers themselves in the value of small trees and the very real damage caused by seemingly superficial injuries to reserved trees. The excellent work done on a few operations as noted above is due to the individual care taken by woods crews. The answer to this problem seems to lie in the logging camp. Where we find young foresters living in the camps who take a real interest in this sort of protection and promote it by talking to tractor drivers, fallers, buckers, and choker men, results soon begin to show. Much also can be done in planning tractor roads carefully and then insisting that tractor drivers keep on the roads except in exceptional circumstances.

Selective logging is largely economics and must be adjusted to fit each individual operation. If considered purely on the basis of self-interest, it will usually result both in lowering costs and increasing realization to the operator. It will also assure adequate reserve stands. But in the case of the stumpage owner who is not interested in manufacture, there is a totally different situation. Only on a buyers' market can the purchaser dictate the type and size of trees he will pay for. This necessarily lowers zero margin diameter limits, as the logger, in leaving trees he must pay for, must be sure that his loss in conversion and sale will be more than that represented by his stumpage payment. An improvement in this situation will come when stumpage rates are based on log grade values. A start in such valuation has been made on some Forest Service sales in the Olympics, Douglas fir stumpage varying from a high of $12 per M. to a low of $3 on one sale. This, of course, is for selectively marked timber, only the higher values being cut. Also, needless to say, it is based on an accurate valuation cruise. Such cruises demonstrate negative as well as positive values.

Selective logging in pine is certain to increase in application as we gain more knowledge of the actual values of individual trees. But in discussing the much disputed subject of sustained yield an entirely different and often misunderstood situation faces us. We may as well discuss it frankly.

First, 92 percent of our operators, in answering a recent forestry questionnaire, expressed the desire to adopt sustained yield as a business policy if it could be shown to be a sound method of managing their forest properties under current competitive conditions. That such is not generally the case in the West you are well aware; although two of our companies operating almost entirely on privately owned lands are managing their properties on that basis, and two others are so situated that they expect to operate permanently, drawing stumpage supplies from both private and national forest lands. Seven or eight more have sufficient tributary timber available on private lands to supply their needs, but their position is precarious. There is no assurance that this timber will continue to be available to them, nor that it can be bought at a price which will enable them to continue in business.

Let me quote at some length from *The Forest Resources of the Pacific Northwest,* published in March 1938 by the National Resources Committee. This report was prepared under the direction of the Northwest Planning Council and represents the impartial judgment of a body which is committed to a policy of encouraging sustained yield in every way possible.

"*Obstacles to sustained yield management.*—It must not be inferred that the private timber owner is refraining from sustained yield forest management because he is opposed to the long-time welfare of the region. Could he see his way clear to adopt it, he would naturally be delighted thus to insure the future of his industry. But, in general, the obstacles seem to him far to outweigh the benefits, and in many cases to be insuperable.

"If mature timber is liquidated today, the money received therefore can be invested in some other enterprise which will, presumably, earn at least a moderate interest rate. Unless stumpage values increase at comparable rates, it is obviously better to liquidate as soon as possible. But, today, the probability of any such rise in stumpage values seems small. The urge for immediate liquidation is correspondingly great.

"*Taxation.*—A very large proportion of the forest resource is owned by non-operators. Taxes are current cash expenditures, and owners of this class have no current revenues from their forest holdings from which to derive the necessary money. It may be easier to become reconciled to a disappointing future profit than to continue annual payments of even relatively small magnitude.

"Even among operating owners, the application of the present system of property taxation definitely handicaps any long-life operation, and particularly, of course, an operation with sufficient mature timber to permit the immediate adoption of sustained-yield management. For purposes of illustration: if two operations are compared, identical in every way except in the quantity of timber owned, that which has but 5 years' supply of timber will pay (at 3 cents per thousand on the standing timber) 15 cents per thousand on the annual cut, while that which has 50 years' supply will pay $1.50. Yet these two plants must sell their lumber in the same competitive market.

"It may be difficult to prove that the forest resource as a whole is paying more than its just share of taxation, but it is obvious that the distribution of the burden within the industry is completely at variance with ability to pay. Since this ability is greatest in the case of rapidly liquidating operators, the present tax system distinctly discourages sustained-yield management and even simpler forms of conservative use.

"*Diversity of ownership.*—If the bulk of the forest resource were owned by a single owner, a reasonable solution might be hoped for. Actually, it is owned by countless individuals and corporations, often in very small lots. The situation differs radically in different parts of the Region, and comprehensive ownership figures are not available. It is known, however, that there are at least half a dozen counties in Oregon and Washington in which half of the forest land is owned in lots of less than a thousand acres. There are some 25,000 timber owners in Oregon and 15,000 in Washington. Even the largest ownerships throughout the Region are widely scattered. In most of the logical sustained-yield units in the Region, diversity of private ownership results in conflicting interests which are difficult to reconcile.

"*Low returns on industrial investment.*—The lumber industry, which is the major forest industry of the Region, has not made large profits except those which have already been mentioned as resulting from the rise in stumpage values during the early years of this country. From 1916 to 1933, inclusive, the average profit ratio (ratio of net income to gross income) of the lumber industry of the United States was only 62 percent of that of all other manufacturing industries. In a single representative year, the lumber industry of the states of this Region had a profit ratio which was only 62 percent of that of the lumber industry of the nation as a whole. This indicates that the Region's lumber industry has been on the average less than 40 percent as profitable as the other manufacturing industries of the country.

"While it may be true that the low profits are a direct result of the rush to liquidate and the consequent maintenance of a buyers' market for lumber, the fact remains that the lumber industry is not in a good immediate financial position to assume the additional burdens that may be necessary in connection with sustained-yield management. In addition, there is small incentive to perpetuate an industry which has been no more attractive financially.

"*Distribution of benefits and burdens of sustained-yield management.*—Finally, the heavy burdens of putting private forests under sustained-yield management are, under existing conditions, largely concentrated on the private owner; while the immediate benefits, particularly during the transition period, seem to accrue for the most part to the public. The owner is, of

course, a part of this public, and thereby shares in the general welfare. But his share therein, whatever it may be, is usually insufficient to induce him to undertake all of the burdens necessary to bring about a system of management of which the public is a chief beneficiary. Public agencies may contend that private ownership of a great natural resource entails definite responsibilities to the public for its proper management. Private owners may accept this principle, but many of them seem to feel that when the public collects taxes on a basis which urges prompt liquidation, it has relinquished its claim on them.

"*The risks in prolonged timber holding.*—Equally disturbing are the uncertainties in the economic future of the regional forest industries. The declining trend of national lumber consumption leaves a doubt as to whether future demand may not have been overestimated. The possibility that eastern forest areas may come back into production and, through their proximity to heavy concentrations of population, win back some part of their former proportion of the nation's lumber business cannot be ignored.

"These possibilities all impel an early liquidation of mature timber. The additional fact that the present competitive situation of the region's lumber industry is based on the large proportion of select grades of lumber which comes from centuries-old timber, and that second growth stands cannot maintain this advantage, is a discouraging element in calculations involving sustained-yield management."

This would seem to make it clear that sustained-yield management is not simply a matter of adopting a desirable business policy or passing a few more laws. At best it will require a long and difficult period of transition, most of which must be devoted to fact finding and the correction of adverse economic conditions.

But to return to present forest practices and the possibility of improving them. In this connection I wish to quote Henry B. Steer, senior forest economist of the U. S. Forest Service, in Technical Bulletin No. 626:

"The day when all the timber cut will come from lands under some form of forest management is rapidly approaching, and all forms of forest management, however extensive they may be, incur some costs. If these costs are nothing more than taxes, as in the case of a forest owner who does nothing with his land but let nature take her course, he must see the possibility of disposing of the "volunteer" forest for a sum that will at least pay the taxes, or he will allow the land to revert to the government. Similarly, he must have reasonable assurance that any forestry practice, from the most extensive to the most intensive, will pay dividends before he can be expected to adopt it. The future of forest ownership depends to a large degree upon the solution of these problems, particularly as they concern the price of standing timber and its relation to the cost of production."

So I wish to say to you quite frankly that the average lumberman considers that he is meeting his responsibility to society fully under present conditions when he leaves his land in a productive condition for growing another forest crop and protects that land from fire at a cost of over $1,000,000 per year in the western pine region; especially while his lands are open to public use and he is directly responsible for less than 3 percent of the fires.

However, if he is given real public cooperation in the adjustment of tax burdens to a cropping basis of valuation; in controlling the epidemics of insect and disease attack which periodically sweep over his forests; in sharing the costs of forest fire control on a basis of responsibility and actual benefit; and in a genuine effort to improve existing economic conditions to the point that private forest management may reasonably be expected to return at least a comparable profit to that expected from other conservative investments, then without question the lumber industry will not only progressively improve its woods practices but will devote its best energies to developing the highest possible type of forest management. This has been the case with other great industries which have been developed by the initiative of our people. So why should it not be so with respect to private forestry? To my mind we are today witnessing the beginning of such a transition.

COMMENTS

By T. D. WOODBURY
U. S. Forest Service

SINCE I have spent my life in public forestry, naturally the public interest in the universal practice of good forestry has a dominating influence in my thinking, and this influence is difficult to suppress. It is quite natural that Mr. Martin and I should disagree on some phases of the private forestry undertaking, and I hope that such disagreement as is evident will stimulate discussion and lead to a better understanding of both sides of the problem. This problem may be stated in its simplest form, as follows: (1) the public desires that private lumbering operations shall be conducted so as to produce successive maximum forest crops of high quality; and (2) lumbermen and timber owners desire to secure the maximum return on the capital which has been invested in their undertaking.

Can these two desires be measurably reconciled? As I look at the situation, we are now engaged in an experiment, the results of which are not yet clearly discernible, to determine whether or not this can be done.

If the result is to be successful, lumbermen must fully realize the public viewpoint and must convince the public that an honest effort is being made to meet public desires in so far as is economically possible to do so. They should realize and evaluate, as many of them doubtless do, that there is clearcut evidence in the world today that one may no longer do just what he pleases with his own. In a number of important countries the rights of the individual are being subordinated wherever such action is in the interest of society as a whole. We still have a large measure of independence in the United States which may be best preserved by due regard for the interests of society. With this condition in mind, I regard it as unwise on the part of the lumber industry to stress too strongly that private forestry depends entirely on cost factors. A small investment of a few cents per M in hazard reduction on cutover areas, or in studies and experiments designed to determine the practicability of methods of logging which will leave cutover areas in more productive condition is in accord with the spirit of the times; it promotes that public support which every industry needs; and it may be regarded as both good advertising and good forestry. Some operators realize this and are doing these things. Foresters and progressive lumbermen, in my opinion, can and should work together more energetically in convincing others of the wisdom of this course of action.

Lack of uniformity in application of the existing forest practice rules is a serious problem which faces the industry. It seems to me that a larger expenditure by the industry in educational and experimental work would be justified, and that some effective means must be found soon for raising the general level of performance. Experience with the private forestry undertaking to date indicates that there is a considerable number of operators who do not belong to any of the lumber associations, and therefore do not consider themselves morally bound to carry out the forest practice rules promulgated by lumber associations. This is a considerable handicap in securing uniform application of better woods practices. It has occurred to me that if voluntary educational effort fails to accomplish better standardization, a system of state licensing might be employed under which only those operators who complied with the industry rules in a manner satisfactory to the state agency would be allowed to operate. This is not as radical as it sounds, since the rules have been formulated by the organized industry and are presumably universally practicable. Mr. Martin has very truthfully stated that the lumber industry is not an entity. I believe he will agree that greater uniformity of action is desirable and would make it possible for him and his associates to work more effectively. Perhaps this can best be accomplished, in so far as forest practices are concerned, through some such urge as the licensing system suggested.

Mr. Martin very evidently regards legislative regulation of woods practices as undesirable. I would qualify this statement; I consider legislative regulation as undesirable unless it is found to be the only way in which we can secure that proper cropping of private timberlands which public interest dictates. It has been said that public regulation would be un-American. Perhaps we must abandon some of our American standards to survive in a changing world. It has been said that it would be unconstitutional. Even if true, we all appreciate that constitutional provisions may be changed, or molded, to meet national emergencies. It has been said that such regulation would be difficult to enforce. The na-

tion has done and can do many difficult things in the public interest. The creation and management of the national forests has involved many difficulties.

In spite of difficulties such as have been mentioned, as I see the private forestry situation in our state at present a considerable measure of optimism is justified by the progress that has been made under the system of self-regulation. In 1933, when the Lumber Industry Forest Practice Codes were formulated, the Forest Service was requested by the federal authority to offer the lumber industry code committees advice as to definite and practicable woods practices which would be acceptable to the public. This we did. As to acceptance of our suggestions by the industry committees, I should say that we did not score much over 50 percent. Naturally, the lumbering groups had ideas as to what should be and could be done. While giving due credit for progress made to the lumber industry employees engaged in forest practice work, to the Forest Practice Committees and to progressive lumbermen, I can not escape the feeling that the practice rules have been rather too static since their adoption. Only a few minor changes in the rules have been made. In nearly every phase of these rules certain operators have demonstrated that better than the minimum practices now standard are feasible. I believe that such demonstrations could, with benefit, be used as the basis for revising, improving, and raising the standard of the practices described.

For example, in the line of hazard reduction some operators have found it practicable to fall snags more generally on cutover areas, and others are piling and burning brush for a limited distance along roads and in other hazardous localities. Some are employing foresters to make economic studies of their forests to determine the realizable present values in various species and sizes of trees; and a few are putting the results of these studies into effect by employing skilled men to see to it that the trees which have been determined to have little or no value now are left for later harvesting. This practice usually results in increasing the quality of the cut and in leaving a larger base of reserve timber to reseed the area and form the basis for a return cut.

Excess supplies of virgin timber and a considerable number of lean profit years seem to have robbed the lumber industry of that spirit of optimism for the future which stimulates long term advance planning. Yearly dwindling supplies of virgin timber and an awakened public interest in creating conditions favoring private forestry seem to me to justify a greater degree of hopefulness. Whatever foresters are able to do to make out a convincing case justifying an optimistic lumber industry viewpoint will most certainly stimulate the leaving of more timber for future cutting which is the basis of forest regulation.

In connection with conservation of immature trees and young growth, some have worked out effective methods of instructing employees and enlisting their interest in this activity, which methods could be employed more generally with advantage without increasing operating costs.

The revision of existing forest practice rules, and a greater degree of standardization of the better forest practices are undertakings which I should like to commend to the industry foresters and Forest Practice Committees for the coming year.

The lumber industry has committed itself to sustained yield as a desirable but doubtfully practical objective. We now have a good many so-called sustained yield experiments on national forest land and a few on private land. These experiments are being watched with interest by lumbermen and foresters. Because forests are a long time crop it will be many years before a business-like and convincing statement can be furnished in regard to these undertakings. During this period other well situated operators, who look at the future with optimism, will undoubtedly plan for harvesting continuous crops on some sort of modified sustained yield basis. At the present time it seems to me that sustained yield must either be left out of our vocabularies or rather broadly defined as the planning for the harvesting of future timber crops which promise to be of adequate volume and quality. With such crops as a basis, more definite and orthodox types of sustained yield may be developed in the course of time as conditions justify. As I view it, sustained yield for American private forests is as nebulous, ill-defined, and unsatisfactory as the reincarnation of the departed at a spiritualistic seance. It can only attain clear-cut form and reality through the test of time. In this process of growth and evolution the Society of American Foresters should be able to play a considerable part by well-directed constructive group effort designed to encourage those industry pioneers who are working toward the desired goal.

A FORESTER'S ANALYSIS OF THE COMMERCIAL NURSERYMAN'S VIEWPOINT

By D. S. OLSON

For many years foresters and commercial nurserymen have not seen eye to eye with regard to the production of forest planting stock. The author of the following article, for many years, has been engaged in the operation of public nurseries, and he has given much thought to the possibilities of developing a better mutual understanding between nurserymen and foresters. His analysis of some of the problems confronting private and public nursery operation and his plan for developing a more harmonious relationship between private nurserymen and public foresters should be given careful consideration by all foresters, especially at this time when the interest in farm forestry is developing rapidly.

A NUMBER of times in the past the JOURNAL OF FORESTRY has published articles concerning production of forest tree nursery stock as it relates to the commercial nursery business. The subject is well worth the consideration of all foresters, because sooner or later they come into contact with it, either directly or indirectly. I have watched the development of this controversy between commercial nurserymen and foresters, and have studied their contentions from the time the ripples started with the creation of state nurseries, through the American Nurserymen Association's protest against tree planting programs of the Bureau of Plant Industry, the Clarke-McNary program, and more recently the shelterbelt project.

To me the concentrated fire of the commercial nurserymen toward forestry programs had always been an enigma. The answer to that enigma is, in my opinion, the solution to the controversy, and the means of working out a plan whereby the two factions can work in harmony instead of discord. I believe I have found the answer.

Foresters are, by the very nature of their chosen profession, patient, creative, idealistic—particularly in planting programs, where they are often dealing with problems the final results of which they never hope to see. Some of the work which they start will pass through three or four generations of foresters. Consequently, extreme care in the beginning of an undertaking is a prerequisite to their jobs. The sad experience of European foresters in planting Scotch pine seed of unknown or misrepresented origin, the bitter disappointment of farmers in western Minnesota and eastern parts of the Dakotas in planting soft maple, are but two examples of many where disillusionment and misrepresentation undermined the foundation of careful planning, and wrought havoc years later. The foresters know they must work patiently and painstakingly from the very start to avoid similar mistakes which might not be apprehended.

To a very large extent foresters have been forced into production of nursery seedlings in order to provide planting stock needed for their programs, but aside from that there has been no other course open which would definitely assure them that the seed and the nursery stock to be used in the beginning of a 30, 60, or 120-year rotation, was of known origin and prime condition, unless they handled that production themselves. After all, nursery production, although an important phase of the work, is only one step reaching toward the major objective of the forester. He is far more interested in the successful establishment of those trees, their longevity, and their ability to serve the purpose originally intended, whether it be for commercial timber, woodlot, pulpwood production, watershed protection or windbreaks, than being in the business of growing trees. However, he is interested and responsible for his part in the completed chain, and he therefore must see that every link is properly forged. Therein lies the principal difference in the viewpoint between the foresters and the commercial nurserymen.

The commercial nurserymen, on the other hand, are primarily and almost solely interested in the sale of their stock. That's their business. But how many care how the individual trees they sold develop 20 years hence? Foresters do. That's their business. This is so important that even in a large program of planting entirely controlled by foresters, care must be taken that seed collection, nursery production, planting, timber management and research covering these activities do not become entities in themselves but all are intimately correlated in order to bring about the desired successful results. And if there is culling, sacrifice, or any other precautionary

measures taken, they should start at the beginning of the cycle.

A fair ratio of costs between nursery stock and cost of planting is 1 to 2; that is, for every dollar spent on stock, two are spent for properly setting out the trees. Adding to that the care and other elements entering into the costs, ten years hence the ratio is increased to about 1 to 3 for a pure forest planting and 1 to 5 for a farm planting where cultivation is required. This greater portion of the investment added to unsuitable stock is throwing good money after bad. What protection is there to the forester's program involving his life work in the following "guarantee" furnished by commercial nurseries which is the limit of protection given the purchaser?

"*Non-warranty*—In the event that any nursery stock or seed sold by us should prove untrue to name under which it is sold, we hereby agree on proper proof of such untrueness to name, to replace that portion of the order proven untrue to name or to refund the purchase price thereof. Except for such liability, and in respect to all nursery stock or seeds sold by us, we give no warranty, express or implied, as to description, growth, productiveness, or any other matter."

The claims by some commercial nurserymen that these various forestry programs are injuring their business are partly true. Such programs do challenge sharp practices of one group, but on the other hand, they encourage better nursery practices among the others. Claims that these programs actually usurp a field of business developed by the nurserymen may be supported by figures of some nurserymen showing a decline in forest tree nursery sales to farmers in the past five years. It is assumed by these nurserymen that the decline is caused by a federal or state tree planting program, but there are other factors that may have a far more important bearing. Take for example the state Clarke-McNary and the federal shelterbelt programs now in operation in the Plains States.

To start at the beginning, woodlot, windbreak, and shelterbelt planting was not developed by the commercial nurserymen but by the government under the Timber Culture Act of 1873. From there it was picked up by the nurserymen. There was a big nursery boom for such plantings up to the turn of the century. In Nebraska alone twenty million trees were planted in one year. Unfortunately, however, most of this stock came from points east. The general decline did not start in 1935 when the shelterbelt project got under way, nor when the Clarke-McNary program started in 1924, but 30 years ago. Other things came into the picture, such as farm tenancy, the auto to take away interest in home development, and the depression. Instead there has been a come-back for these nurserymen taken as a whole the past five years. The agricultural census for 1930 shows forest tree sales for all nurseries in Texas, Oklahoma, Kansas, Nebraska, South Dakota, and North Dakota combined for the spring of 1929 (before the depression) as 4,184,760 trees. Compare that with present sales. The U. S. Forest Service bought considerably more than that from commercial nurseries in restricted areas in those states in 1935. There may have been a decline in some nurseries in sales the past five years, but it has been more than offset by increased business in others and new commercial nurseries set up since then.

Years ago I had a long and interesting talk with Mike Cashman, commercial nurseryman at Owattona, Minn. He was an ardent scrapper when this controversy first started. The first three hours on this visit were spent trying to get him cooled off, when he found out I was a government nurseryman. He claimed I was ruining his and every other nurseryman's business. I finally wedged in a few words edgewise to make a wager that he couldn't find 300 western larch, western red cedar (*Thuya plicata*), or western white pine seedlings in all the commercial nurseries of the United States. He said, "No, of course not. Why?" I pointed out that my nursery then was growing four million of these trees a year to reforest the burns on national forests in northern Montana and Idaho. Well, that was something different and he explained that he had been misinformed about the work of some of these forest tree nurseries, and certainly did not expect the commercial nurserymen to set up in a new business of that kind, or claim it as their legitimate field.

This case is illustrative of many similar ones that have come to my attention, indicating that the commercial nurserymen at large have been misled into thinking that the various forestry programs were encroaching upon their field. On the contrary, not a single state or federal tree planting program under the supervision of foresters, to my knowledge, has found an available supply of trees among the commercial nurserymen to initiate those programs. But some of the commercial nurserymen are sharing a lot of that business now.

The whole issue is clarified when the smoke

screens are removed and the simple point involved is laid bare. The commercial nurserymen want to share in these new programs created by foresters, and I have no quarrel with that. It does irk sometimes to have them claim such business after it has been developed by others and from which they profit more than anyone else, when they have been instrumental in retarding its progress. Obviously the system is all wrong if after developing a program, attempts are made to have foresters adjust it for the commercial nurserymen, when by so doing it jeopardizes the program itself. On the contrary, nurserymen must adjust their business and cooperate and protect the exacting requirements of forestry in their programs if they are to share in the business of producing the seedlings.

Commercial nurserymen and foresters have a great deal of valuable information regarding trees that should be pooled to the benefit of all. To state and federal foresters the measuring stick is "greatest good to the greatest number of people." It can't be otherwise. Foresters and nurserymen alike need to scrutinize their methods in nursery practice to remove faults that are injuring their future work. Laws requiring certified tree seed should be established to protect the nurserymen as well as the foresters and other users. Uniformly safe practices among foresters in various agencies need to be developed.

On the other hand, foresters cannot afford to place their carefully planned, long-time programs on foundations made insecure by a few commercial nurserymen who practice "sharp" methods. Federal and state agencies cannot very well exclude these individuals, but must consider the whole field. This injures the dependable growers. It is impossible to protect oneself by inspection of the goods since many injuries caused from faulty handling, such as dry freezing, cannot be detected until after planted. Source of seed is impossible to detect unless the collection points are known, and there may be many things wrong with the quality of the seed difficult to detect. The money loss is little compared to the disappointment in results that are obtained. And there is even a greater loss to all. Too often poor results have been blamed to the severity of climatic conditions, when actually the fault lay in the stock or methods used. Such experience leads to the general conclusion that "the trees won't grow" which injures forestry programs and future nursery business. For example, in certain sections of the South there are whole counties where trees won't be planted "because they die." The conclusion of the local people is that no trees will live on those soils and under those climatic conditions. The truth of the matter is that certain trees susceptible to the "cotton rot" of the South are dying. Instead of continuing to try to sell those people trees that are sure to die, as is now being done, nurserymen and others interested should develop a market for the species immune or resistant to the cotton rot.

Dependability of the individual nurserymen will have to be left to the nurserymen themselves. Their large organizations would be doing a real service to their members and forestry agencies by adjusting their practices and developing new and improved methods to meet these new programs, such as the medical associations, the pure food and drug law, the Bureau of Standards, and similar methods which have been worked out to protect the business or profession and the consumer.

There is much to be done to arrive at a common, thoroughly informed understanding by the commercial nursery industry and by foresters. The problems of both should be analyzed. The full facts should be developed having to do with both points of view and surrounding both types of enterprise. With a full, accurate presentation from both sides, there would be a basis for a more intelligent meeting of minds by representatives of the commercial nurserymen's group and the foresters' group.

MARKETING CORDWOOD IN NEW HAMPSHIRE

By HENRY I. BALDWIN
N. H. Forestry and Recreation Department

It is comparatively easy to engage in forest improvement activities when the public pays the bill. It is much more difficult to engage in such activities when the resulting forest products have to pay the bill. In the following article Dr. Baldwin describes what is being done in New Hampshire to market the fuelwood resulting from stand improvement not only with a profit to the forest owner but at the same time giving low public cost employment to people in distress.

RELIABLE markets for low-grade wood are essential to the profitable practice of intensive silviculture, especially in New England, where a large part of most second growth stands is composed of relatively low-quality material. Here the forester is faced with the problem of building up quality where two centuries of culling (defective trees were and are being left in most so-called clear cuttings) have deteriorated the stand in composition and tree form. The age-old custom countenanced by a *laissez faire* attitude on the part of both owner and operator has been to cut the best and leave the worst. The remedies now are either to clear-cut and clean up the land, and start an entirely new crop, or to reverse the cutting policy, and improve existing stands by removing the poorer species and specimens and encouraging the better. This reversal of policy is usually considered directly counter to economic pressure. Few private owners or enterprises dare attempt it, or believe they can afford it. It takes both financial strength and strength of character for an owner of timberland to forego immediate income or to incur present expense for the sake of greater future reward. The net result in most cases is that either nothing whatever is done, or the lands are operated in the good old way of sapping the best that is in them until they are in a condition where nothing more can be extracted from them. It should be noted, however, that these forests of low productivity are expected to pay the same taxes regardless of whether they are growing slowly or fast, or producing good or poor quality timber. The practice of planned forestry and disposal of low quality wood does not at once result in an increased tax burden.

A measure attempted on a considerable scale with liberal outlay of public funds has been stand improvement from the purely silvicultural viewpoint with more or less disregard of economics. The impressive areas covered in such work by the C. C. C. and others testify to its successful execution, but tell little of the profits and losses.

Another possible solution of the dilemma is to seek out and meet new markets for fuelwood, pulpwood, small poles, posts, bark, and boughs, so that the low grade wood may be removed to improve the stand and that some income may be obtained, or at least no outlay be required for improvement. In the present paper some attempts at improvement of stands by this second method will be described.

Fuelwood possesses some marketing advantages as a forest product. It is frequently a final consumer product and often approaches being a necessity of life; for the inroads of oil burners have not yet totally spoiled the pioneer reliance on wood of the indigenous Yankee and hardy French Canadian. The demand as well as the price of common necessities sold direct to consumers fluctuate less and are less affected by depressions of general business. Foresters are prone to think in terms of sawlog or pulpwood products and consider (unconsciously perhaps) such a lowly business as cordwood beneath them. Yet, when pine stumpage cannot be moved at all, and pulpwood markets fail, fuelwood sales are not to be scorned. Prices for fuelwood on the stump or yarded to a trucking point have varied surprisingly little from year to year since war time. In fact the fuelwood market stands firm or is even improved in times of financial depression.

Besides providing an outlet for low-quality trees and having a relatively stable market from year to year compared with sawlogs and other products, cordwood has another marketing characteristic which should be mentioned. When forest products are sold to wood-using industries a better price and a more ready sale are obtained when a large volume is sold at one time. This was demonstrated in the fall of 1937 when 25,000 cords of pulpwood were sold in northern New Hampshire at a price several dollars per cord higher than the current price for small lots

of equal quality. It is seldom that saw timber located far from a permanent mill can be sold at all unless a substantial quantity is offered. With fuelwood this does not hold. Small lots are salable every year in a way which is favorable to a small sustained operation. Large lots do not command a higher unit price, but rather the contrary; they appeal only to wholesalers and not to ultimate consumers. A large quantity can break the market and result in actual lumping.

A further point to be remarked is that fuelwood logging usually requires less skill than other operations, and hence suitable labor is easier to obtain. Tools and equipment are the simplest possible and rates of pay are more or less standardized. Fuelwood also will keep for several years if properly piled, and it is one of the few forest products whose value increases when kept several months after harvesting. Cordwood, if reasonably well split and piled, can be held two or three years without loss if for any reason a sale is not made the first autumn after cutting. Gray birch and other inferior woods will of course decay rapidly. A small regular annual market for cordwood, especially one consisting of customers who are ultimate consumers is a great asset to a small forest property. It assures the orderly carrying out of thinnings from year to year.

Fuelwood is sold most commonly "yarded to truck," i.e., piled along a highway or in a field accessible for trucking to a city wood yard or to the consumer direct. It is also sold f.o.b. cars for shipment by rail, or occasionally piled in the woods. Sale of stumpage is apparently less often practiced than with other forest products. In New Hampshire it is best developed in the northern part of the state.

Stumpage Sales

Having mentioned some of the general aspects of fuelwood marketing a few examples will be cited. A large share of the writer's time has been devoted to forest operations and to marketing forest products (and collecting payment) during the past fifteen years. It may be said that no product has had such a stable market from year to year, nor involved less risk of loss from the operation. The Jericho Experimental Forest of the Brown Company located in Berlin and Milan, N. H., was developed primarily to yield pulpwood, and each year while it was managed by the writer one or more thousand cords of spruce and fir pulpwood were cut and delivered to the mill by rail and truck. Upward of one thousand cords each of poplar pulpwood and birch spoolwood were also sold to mills in Maine. The birch tops were sold to local men who worked them up into fuelwood. In addition stumpage permits were issued, and hardwoods marked for cutting. One year over 200 such stumpage sales were made and considerable areas of young spruce and fir were thinned by removal of competing maple and birch. Little or no wind damage has resulted in these stands, and they are now making rapid growth.[1] The price charged for stumpage varied with location and quality of wood cut. The better northern hardwoods accessibly located brought $2; soft maple and birch usually $1 per cord. A deposit was required before cutting commenced, and the wood was scaled and payment in full collected before the wood was yarded.

Reference has been made to the stand improvement work carried on by public agencies as a direct outlay. The purpose of this paper is to suggest how this can be avoided by marketing. However, two examples will be cited of how relief work was used to improve the forest without direct expense for forest improvement. These were admittedly unusual circumstances, but they show what can be done in reducing the costs of relief and the costs of forest improvement.

With the beginning of acute unemployment in 1930 and 1931 larger stumpage sales were made to the county commissioner and later to the city overseer. Men who were receiving relief were sent out to do the cutting. In some cases they were credited with what they cut at a fixed price per cord, in others they were required to cut six cords each as a condition for receiving aid. In this way large quantities of fuelwood were cut, which was yarded and trucked to these men and to other families not possessed of able-bodied choppers. Silvicultural possibilities were not neglected. Cutting areas were confined to stands in which conifers could be released. This procedure, saved the county over $8,000 in one year and furnished substantial revenue to the forest. The monetary revenue, however, was far

[1]This paper was written and submitted for publication before the hurricane of September 21, 1938. The logging costs mentioned here have increased temporarily, but the statements about marketing are believed to hold true even today and the need for disposal of low quality products and the desirability of conserving trees of promise will be far greater in the immediate future because of the severe losses which have been sustained by the best growing stock.—H. I. B.

surpassed by the improved conditions of the conifers for rapid growth.

When faced with supplying over 1000 cords to the city in one sale a year or two later, it was desired also to remove certain mature spruce and balsam fir, and high quality paper birch for spoolwood bolts. An arrangement was therefore made whereby the city took a contract to cut, yard, and load on cars the spruce and fir pulpwood and paper birch spoolwood at a stipulated price, and to purchase on the stump the lower grade material for fuelwood. This combination contract proved a most happy solution for all parties. The payments received by the city for getting out the pulpwood and birch more than offset the expense of yarding the fuelwood, the greater volume resulted in lower logging costs per unit, and a large number of unemployed were occupied throughout the winter. The land owner received a substantial return from fuelwood stumpage, with less overhead expense than otherwise. The entire operation reduced the relief costs of the city by over $10,000. The forest was left excellently cleaned up and well stocked with softwood. Balsam fir was cut to a minimum diameter limit without marking while all spruce trees of varying diameters were marked for cutting. About 400 acres were treated in this operation, and today it contains a valuable stand of spruce and balsam fir pulpwood.

Fuelwood marketing in southern New Hampshire suffers from a lack of opportunities for similar large stumpage sales under favorable conditions, but extensive areas have been thinned by this method on the Fox Forest, owned by the state of New Hampshire, and on private lands. The sales have usually been small and the cutting has been done by individuals. Again the combined stumpage sale and contract logging scheme has been applied. As an example an area of perhaps 2 acres has been marked out by spotted lines and lumber crayon in the presence of the applicant, and the trees to be cut marked and branded on the stump. A deposit of 50 cents to $1 is paid by the applicant at the time. Trees from which sawlogs can be cut are then specially designated and the stumpage permittee agrees to cut such logs as can be made from them according to specifications at a certain price per M.b.m. usually $2. The tops are then cut into fuelwood as part of the stumpage bought. After cutting, the wood is scaled and charged to the purchaser, and the logs scaled and credited against the amount owed on the wood. When the wood is yarded, the logs are picked up at the same time, and the teamster paid for landing them at a central point for trucking. Thus many scattered high-quality logs are gathered over an area where logging for them alone would not pay, and the stumpage buyer can wholly or partially "work out his stumpage." It has also happened that stumpage buyers have worked out their debts by one or more days work on the forest roads, or by cutting fuelwood for market, and thus avoided a cash outlay. These and other schemes have been employed to thin, release, and otherwise improve woodland without direct outlay except for supervision.

Contract Logging

Cutting cordwood by contract and then selling either wholesale or retail has also been an annual or even continuous activity on both the Jericho and Fox Forests, and on several private tracts. It has the great disadvantage in that it requires the advance of working capital in the form of wages, risks larger amounts of money, and involves more complications in scaling, selling, billing, and investigating credit.

The steps are usually as follows: (1) The number of acres to be cut through each year and their location as set forth in the working plan indicate the amount and location of the cut. (2) The trees are then marked, and a contract is made to cut and deliver the various grades. (3) In case a sale of sawlogs has been contracted for (this type of sale follows the same procedure) the tops and defective trees are utilized for fuelwood. The prices paid in southern New Hampshire during the past five years have been approximately $2 to $2.50 per cord for cutting and piling Grade 1 fuelwood (cleft, sound hardwood) and $1.75 to $2 per cord for Grade 2 (limb wood, defective or crooked hardwood, and cull softwood). Grade 2 wood is usually logged at a slight loss, but this is justified by (a) the greater volume, giving work to more men, or for a longer period, (b) cleaning up the forest, and hence avoiding the need of slash disposal, and (c) the loss is offset by the greater profit on the carefully graded high quality wood, which is easier to sell. As the stands are improved, and defective trees become scarcer the proportion of Grade 2 wood will decrease. At present it amounts to about 10 percent of the contract cut on the Fox Forest.

Wood Sales

After the wood has been hauled to the yard or where it can be reached by truck, it is usually allowed to season until fall before being sold and delivered. Occasionally wood is sold to dealers in advance, and paid for as it is trucked away after seasoning. In any case dealers in nearby cities, acid plants, or other large users make up the outlets for larger quantities and the wood is invariably sold and removed in 4-foot lengths. Curiously enough a sale of 250 cords was recently made to a C. C. C. camp by a private forest in this region. These include what may be termed wholesale transactions. They are desirable where cash is paid before or at the time the wood is removed, or where credit is good enough to insure prompt payment. The price received per cord is relatively low, however.

A few retail sales at the forest are made to local residents. They are the chief outlets for Grade 2 wood, and there is more or less difficulty in securing prompt payment, especially since many of the purchasers are in financial straits. Local retail sales are discouraged because of possible conflict with local dealers who may also be wholesale customers of the forest. In one year, however, 1500 cords were sold in this manner from the Jericho Forest, delivery being made with trucks hired for the purpose.

A special type of retail sale has proven fairly successful at the Fox Forest. During several years, a selected list of fireplace wood customers, largely residents of Boston's numerous suburbs, has been built up, and fireplace wood cut either 24 inches or 16 inches as desired has been delivered to them by truck direct from the forest upwards of 100 miles. When requested by the customer it is carried in and piled in his cellar at an extra charge. The wood is sawed and repiled in one-half-cord frames at the forest by a sawing machine owner at a contract price per cord, and delivered as the orders are received by a common carrier trucking firm which operates a daily trucking service between Greater Boston and various New Hampshire towns. The advantage of the higher net stumpage received in this way is partially offset by the greater amount of bookkeeping, correspondence, and telephone charges, but its chief advantage is a fairly constant and assured annual outlet for the better cordwood. Stumpage returns usually exceed those from clear sawlogs cut from the same tree. Retail sales of this sort have always yielded a substantial net profit and bills in every instance have been paid promptly. A fancy grade of paper birch fireplace wood is also much in demand. Kindling has been sold in Boston from at least one private forest in this region. Bags of dry pine cones (by-product of seed extraction) are occasionally included as presents. Not the least of the results of this form of marketing has been the educational effect. Many friends have been made, and their interest in forestry stimulated, and they have visited the forest and learned how they might improve their own lands without costly treatment.

Although oil and gas burners have displaced wood in some country districts, recently there has been a revival of interest in wood-burning heaters, and many poultry raisers in New Hampshire have shifted from coal and oil brooders to wood-burning brooders with very satisfactory results and with savings in fuel costs. Slow combustion wood stoves and furnaces also have been installed in country homes to some extent.

These experiences and the advantages of fuelwood as a forest product in connection with sustained yield operation of small forest properties in New Hampshire are still limited in application. As mentioned earlier, the market absorbs but a fraction of what could be cut, or what should be, were all the millions of acres in need of improvement cuttings to be operated. The fact is a large amount of potential sawtimber is put into fuelwood. If all the available market were met by improvement cuttings we could grow sawtimber faster and of better quality. Most saw milling operations are now followed up by cordwood cutting. Small forests can market fuelwood successfully, but vast quantities can be sold only with difficulty. New industries which can utilize cordwood for pulp, wallboard, plastics, or similar uses are a prerequisite for large-scale forestry operations, and to build up the depleted growing stocks. As long as commercial operations are primarily restricted to saw-log cutting the volume of growing wood suitable only for cordwood will increase to the distress of the owner in search of a steady income from his forest. Any small favorably located forest in New England, however, can be made to pay today if sufficiently energetic efforts are made to find markets for its products.

VARIATION IN THE SPECIFIC GRAVITY OF THE SPRINGWOOD AND SUMMERWOOD OF FOUR SPECIES OF SOUTHERN PINES

By BENSON H. PAUL[1]
Forest Products Laboratory[2]

Active interest in timber growing in the South as a result of the expansion of pulp and paper manufacture has emphasized the need for greater technical knowledge of the characteristics of the southern pines. Studies at the Forest Products Laboratory show that the weight or density of any of the four most important species of southern pine—slash, longleaf, loblolly, and shortleaf pine—may vary over an exceedingly wide range. Sometimes certain pieces of wood have double the density of other pieces of the same species. Such variations in density have a direct bearing upon the strength, workability, shrinkage, ability to hold paint, and other properties as well as upon the quality and yield of pulp from these species.

IT has been recognized that with wood from different stands, or different parts of a tree, the density of summerwood and springwood is likely to show considerable variation. A determination of the extent of such variability on a basis of separate specific gravity determinations for both parts of the annual ring has been made for nine second-growth trees of the four southern pines; slash, longleaf, loblolly, and shortleaf.

The trees that supplied the material for study contained scarcely any heartwood. Because of the absence of heartwood and because of the relatively low age of the trees studied it is not presumed that the total range of variability is represented in the specimens from any of the species.

Methods of Investigation

Disks about one inch thick were cut at 4-foot intervals throughout the length of each tree. The disks of any one tree were designated alphabetically from the base upward. The radius in inches and the width of the annual rings in hundredths of an inch were measured and recorded along an average radius on each disk. The average rate of growth is given as rings per inch in Table 1.

From each of the disks a strip one-half inch wide was cut along an average diameter. The summerwood and springwood of each ring on both sides of the pith were then separated as accurately as possible with a hand knife. Immediately after cutting, the samples were marked with the disk number and the ring number, the rings at each section being numbered consecutively from the bark inward.

Volumes of the samples were determined separately in a Breuil mercury volumeter (Fig. 1) and the green volumes recorded. They were then placed in an electric drying oven for 24 to 48 hours. The oven was held at a constant temperature of 103° C.

After removal from the oven the specimens were immediately weighed and again run through the mercury volumeter to determine the dry volumes.

The weighing was done on an analytical chainomatic balance. The procedure consisted of removing one specimen at a time from the weighing bottles, replacing the cover, and reweighing the

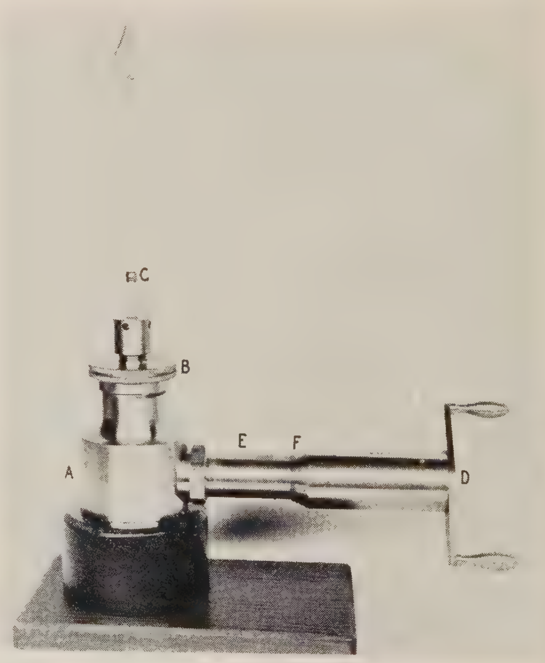

Fig. 1.—Breuil mercury volumeter. *A*, mercury chamber; *B*, threaded cap; *C*, marker; *D*, revolving piston; *E*, scale; *F*, *vernier*.

[1]Acknowledgment is made to Otto H. Schrader for the measurements reported on in this paper.

[2]Maintained by the U. S. Forest Service at Madison, Wis., in cooperation with the University of Wisconsin.

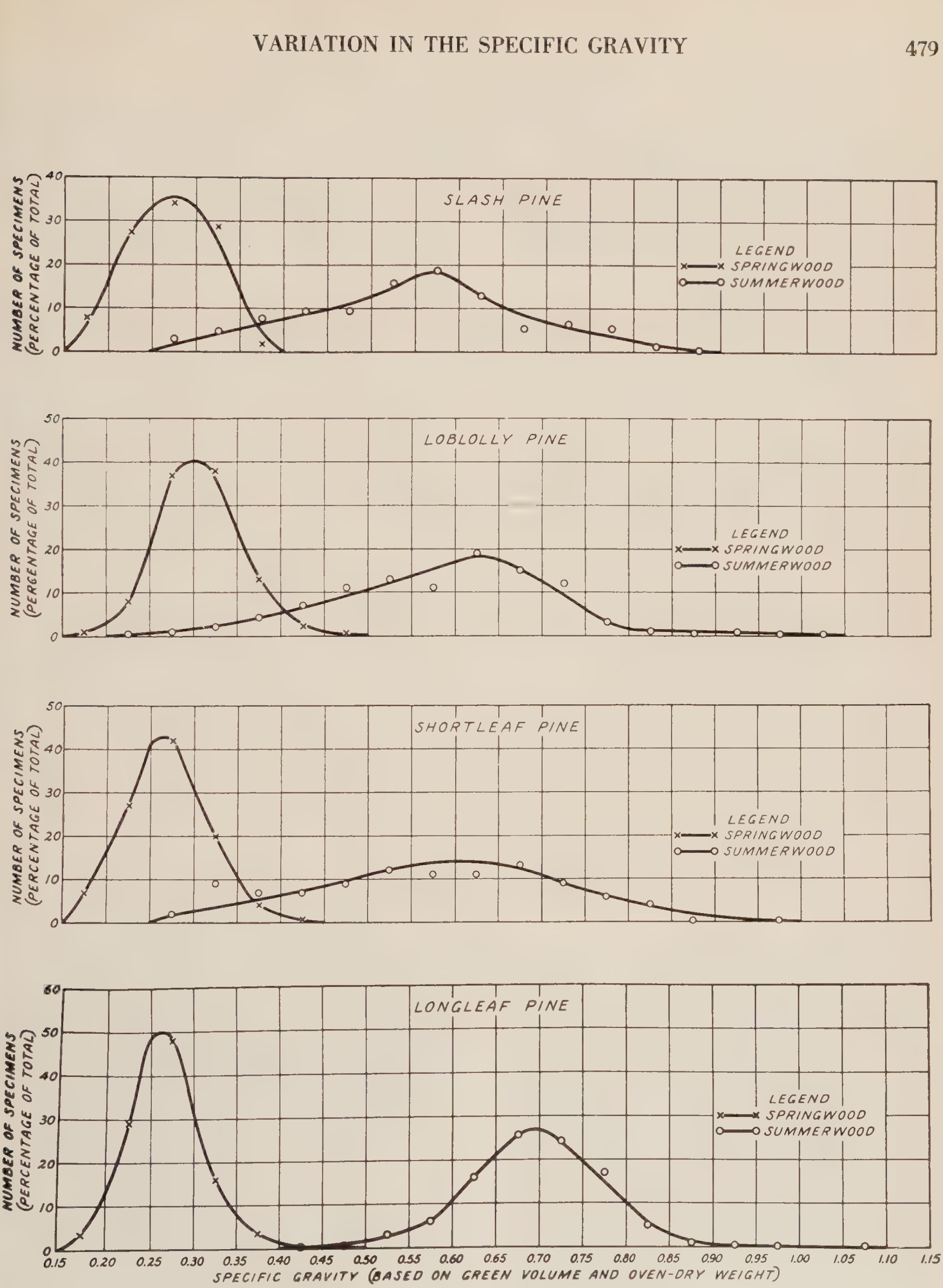

Fig. 2.—Variability curves of specific gravity values separately for springwood and summerwood in four species of southern pine.

bottles. By subtracting two consecutive weights, the weight of each individual specimen was obtained. Weights were recorded in grams to the fourth decimal place.

To determine the volume of an individual specimen by the Breuil mercury volumeter the procedure is as follows: The cap *B* (Fig. 1) is unscrewed and the specimen placed in the mercury chamber *A* which contains only enough mercury so that when the specimen is submerged in it, it does not overflow. The cap is replaced and the piston *D* is revolved until mercury is forced up into the capillary tube and the height adjusted to correspond to the arbitrarily placed marker *C*. A reading is taken at the scale on top of the barrel *E* and the vernier *F*. The piston is then revolved in the opposite direction until the mercury is below the top of the cap and the specimen is removed. The cap is replaced and a reading is taken for the mercury alone when brought back to the level of the marker *C*. These two readings are subtracted and the result is multiplied by 3 which gives the volume in cubic centimeters since this volumeter is graduated in units which read one-third of the actual metric volume. The graduations and vernier give a reading to 0.001 inch (0.003 c.c.) from which, together with the weight, the specific gravity is computed.

Specific gravity is the ratio of the mass of a body to the mass of an equal volume of water at 4° C. Both the volume and weight of wood vary with its moisture content so that it is necessary to specify the conditions under which these values are determined.

For comparative purposes the green volume of wood and the oven-dry weight of wood are more satisfactory since the wood has not been subjected to shrinkage, which varies with the method of drying and influences to a degree the volume of the oven-dry specimens.

The work presented here differs from previous determinations of the specific gravity of wood in that it deals with the specific gravity of springwood and summerwood separately. No attempt was made to combine the two because the real object of this study was to obtain separate determinations and compare their variations and general trends. The use of the Breuil mercury volumeter tends toward more accurate results with the small specimens required in studying springwood and summerwood separately than was possible under former methods.

The method of study used gave the variation of specific gravity of springwood and summerwood within the tree from the pith to the bark and from the stump upward. Variability curves for the specific gravity of springwood and summerwood based upon green volumes and oven-dry weights of specimens for the trees of each species are presented in Figure 2. Similar curves based upon the dry volumes and oven-dry

Fig. 3.—Cross section of longleaf pine showing clear demarcation between springwood and summerwood bands within the annual growth rings.

Fig. 4.—Cross section of loblolly pine of rapid growth showing poorly defined limits between springwood and summerwood bands within the annual growth rings.

weights were prepared, but they show no difference except the values were somewhat higher because of the smaller volume of the dry specimens. The variability curves show considerable range in the specific gravity of both springwood and summerwood in each species studied. Since the summerwood variability curves taper to narrow limits at each extreme of the curve only the range of the middle three-fourths of the specimens is given in Table 1.

Specific Gravity of Springwood

The springwood of all four species was found to be quite similar in density (Fig. 2 and Table 1). The minimum specific gravity value of springwood in all species was 0.15, while the maximum ranged from 0.40 to 0.50. The average springwood values were 0.265 for shortleaf, 0.275 for slash, 0.280 for longleaf, and 0.310 for loblolly. No importance should be attached to the order in which the species fall when arranged according to the sequence of average springwood specific gravity values, because the order is changed when the sequence of average summerwood values is considered. It may be noted that the average specific gravity of the springwood of the four species is approximately one-half that of the summerwood.

Specific Gravity of Summerwood

The average values obtained for the specific gravity of the summerwood were 0.570 for slash pine, 0.600 for shortleaf pine, 0.625 for loblolly pine, and 0.690 for longleaf pine (Table 1).

In all species except longleaf, summerwood was found to be more variable than springwood. Springwood specific gravity values of the middle three-fourths of the specimens in all four species varied from 18 to 22 percent on each side of the median value, whereas summerwood specific gravity values for the same proportion of the material in all species except longleaf varied from 24 to 35 percent on each side of the median. In longleaf a comparable summerwood variation was only 13 percent. With a relatively wide range in the summerwood specific gravity values of each species, the average specific gravity value of summerwood from this number of trees cannot be taken as decisive for evaluating the comparative quality of the summerwood of these species. Longleaf pine, which showed the most definite banding of springwood and summerwood in the annual growth rings, contained the heaviest summerwood (Fig. 3). On the other

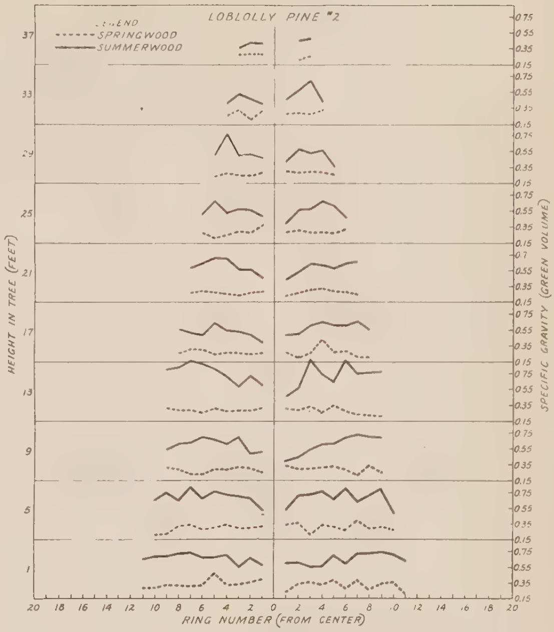

Fig. 5.—Specific gravity of loblolly pine springwood and summerwood according to position of samples in the tree.

hand, loblolly, which had a rather indefinite transition from springwood to summerwood in the growth rings, produced the heaviest springwood (Fig. 4).

Variation Within the Tree

The variation in specific gravity is similar within the trees of the separate species. A diagram showing variation in one tree of loblolly pine is shown in Figure 5. As a rule, the springwood gradient from pith to bark is either slightly decreasing or level. From butt to top it definitely decreases. The summerwood gradient increases from pith to bark and decreases from butt to top; sometimes an increase from the bottom of the crown to the top of the tree is evident. Combining these observations we notice that when the relative proportion of springwood and summerwood remain the same the heaviest wood will be found in the lower portion of the tree. Likewise, in the cross section, with the same hypothesis, the heavier wood will be found on the outside of the tree. In general, however, the relative proportions of springwood and summerwood do not remain constant in any tree; the summerwood usually becoming proportionately less with increasing height and widely varying proportions existing from the center outward, depending upon stand density, the supply of soil moisture, and other factors of growth.

Explanation of Density

The density or specific gravity of wood substance is about 1.56. If wood contained no air spaces it would sink in water. The degree of buoyancy of wood is governed by the amount of air that it contains. When all the air spaces in wood are filled with water it will sink. The thickness of the cell wall and the relative size of cell cavities influence the specific gravity. In the springwood the cells have thin walls and the lumen or cell cavity is relatively large. In summerwood cells the walls are often many times thicker than those of springwood cells and the cell cavities are very small. In either springwood or summerwood it is the relative proportion of solid substance that determines the specific gravity or density of a piece of definite volume. The higher summerwood values for longleaf over shortleaf in the material studied may be explained in this way even though the age of the trees and rate of growth are similar. In slash and loblolly it appears likely that material with more clearly defined bands of springwood and summerwood might have contained heavier summerwood.

Table 1.—Number, Age, and Size of Trees, Average Specific Gravity, Rate of Growth, and Range of the Middle Three-Fourths of the Specimens for Springwood and Summerwood in Four Species of Southern Pine

Species	Number of trees	Age	Diameter breast height	Rings per inch	Portion of annual ring	Specific gravity (Green volume and oven-dry weight) Range of middle three-fourths of specimens	Specific gravity (Green volume and oven-dry weight) Average of all specimens
		Years	*Inches*	*Average*			
Slash pine	2	12-13	6-8	3.5	Springwood	0.21-0.33	0.275
					Summerwood	0.38-0.70	0.570
Shortleaf pine	2	24	5-6	7.0	Springwood	0.21-0.33	0.265
					Summerwood	0.36-0.74	0.600
Loblolly pine	3	12-13	5.5-11.5	3.7	Springwood	0.25-0.36	0.310
					Summerwood	0.44-0.72	0.625
Longleaf pine	2	23-24	7.0-8.5	6.3	Springwood	0.22-0.32	0.280
					Summerwood	0.61-0.79	0.690

Bordeaux Paint for Covering Tree Wounds

BORDEAUX paint, made by mixing equal weights of raw linseed oil and Bordeaux powder, makes a good protective covering for tree wounds and pruning cuts, says Dr. Rush P. Marshall, shade tree specialist of the U. S. Department of Agriculture.

This substance, like the creosote and tar mixtures used for the same purpose, may injure the tender growing tissues just beneath the bark, but this can be prevented by coating the growing tissues with a preliminary covering of shellac. Bordeaux paint is one of the most effective fungicides. It should not, however, be used on moist wood, as it will not stick.

When the Bordeaux powder is first added to the oil, it makes a paste, but after standing an hour or two this thins to the creamy consistency of a heavy paint. Dr. Marshall says it is best to mix a fresh lot whenever it is to be used. As a thick coating over the wound is desirable, the paint should not be brushed thin when applied.

A MODIFIED TREE CLASSIFICATION FOR USE IN GROWTH STUDIES AND TIMBER MARKING IN BLACK HILLS PONDEROSA PINE

By E. M. HORNIBROOK

Rocky Mountain Forest and Range Experiment Station

A satisfactory silvicultural management of ponderosa pine stands requires a judicious selection of trees to be left in the reserve stand. The timber marker must know what type of tree has the greatest growth potentialities and what type of tree will respond but slightly upon being released. The silvicultural problem in marking therefore is one of recognizing the combination of characters, age, and crown vigor, which indicate high or low growth capacities. The trees selected for cutting should be those which have ceased growing or which have lost their ability to respond to an increase in light, nutrient substances, and soil moisture. The trees of merchantable size which are left to form the nucleus of the second cut should be those which will respond most to release and maintain their productive capacity for the greatest number of years.

IN the summer of 1936 the Rocky Mountain Forest and Range Experiment Station undertook an investigation of the growth and yield of selectively cut stands of ponderosa pine in the Black Hills of South Dakota and Wyoming. One of the important factors involved in such a study is to determine the reaction of individual trees composing the reserve stand to release by a selection cutting. Such a study is based upon the hypothesis that the growth rate of a reserve tree is dependent not only on the amount of release resulting from cutting adjacent trees but also upon the age and vigor of the individual tree left.

When the type of tree most likely to maintain a high rate of growth can be recognized with a fair degree of certainty the forester can mark a stand so as to leave it in the highest productive state. Trees left in the reserve stand are an investment and a bad investment is nearly as wasteful of timber and land resources as absolute depletion. In theory, the aim of the forester intent on the management of a forest property is to produce the highest quality and quantity of timber in order to produce the highest financial returns and yet maintain the soil at its highest productive capacity.

By a system of marking that removes the poor vigor classes the stand will gradually be improved in growth rate from that of the wild state to that of a well managed stand. Marking by a tree classification is merely the application of a principle long in use by plant and animal breeders. No successful stockman retains stunted and diseased stock for a breeding herd, nor does he purchase that type of stock to use as feeders to convert surplus feed supplies into marketable stock.

Timber marking has been described as an art. Unfortunately, an art is largely dependent upon the development of native ability based upon knowledge and balanced with equanimity. A tree classification based upon facts provides the knowledge. It is a tool that will aid inexperienced men to become proficient in timber marking, and perhaps aid those who have already acquired the so-called art. It is a useful instrument for the measurement of growth and the prediction of future yield. It does not provide fool-proof rules for marking, however, because other factors must be taken into consideration, such as disease, defects, injuries, character of the stand, and the volume required for cutting.

A number of tree classifications, applicable to even-aged stands were developed in Europe such as those by Kraft (*5*), Heck (*3*), and Schotte (*6*). Taylor (*8*) developed a tree classification for lodgepole pine. Dunning (*1*) pointed out the need for a tree classification to fit ponderosa pine stands in California and later (*2*) published a classification for that species. Keen (*4*) found, in studying the relative susceptibility of ponderosa pine to bark beetle attack in the Pacific Northwest, that it was desirable to set up a more detailed classification which had greater sensitivity in reflecting insect susceptibility than was obtained by Dunning's classification. Keen's system sets up four age groups (1, 2, 3, and 4) and within each age group four vigor groups (*A*, *B*, *C*, and *D*) making a total of 16 tree classes. Although Keen's classification was based primarily upon susceptibility to bark beetle attack, it embodies a basic hypothesis—that young trees grow faster than old trees and that for a given age full-crowned trees grow faster than those with short, sparse, or one-sided crowns, and that trees with dense, vigor-

ous appearing crowns grow faster than those of apparent poor vigor.

The purpose of this investigation was to determine, when Black Hills ponderosa pine trees are classified according to Keen's classification, whether that classification is a reliable criterion of the relative growth capacities of those trees both in uncut and selectively cut stands. In this instance only the diameter growth of trees of the various age and vigor classes is considered. No attempt has yet been made to correlate seed production, mortality, disease, defect, log or lumber grades, and susceptibility to insect attack with age and vigor classes.

Susceptibility of ponderosa pine to attack by the Black Hills beetle (*Dendroctonus ponderosae* Hopk.), the most common and destructive bark beetle in the Black Hills, should be thoroughly investigated. It is believed, however, that the present practice of doing bark beetle control work immediately upon the appearance of an attack by the Black Hills beetle precludes any benefit that might be derived from timber marking by a tree classification.

Methods of Study

In a number of uncut stands, scattered throughout the Black Hills and Harney National Forests, 20 trees in each of Keen's 16 age and vigor classes were classified, crown and bark characteristics described, and age and accretion borings made. Each tree was bored at breast height with an increment borer at points diametrically opposite. One core was taken to the center of the tree and the rings were counted to determine age at that point. Total age was determined by adding 17 years to the breast height age.[1] The other increment core was made long enough to include 25 annual rings. The radial growth, inside bark, for the preceding 25 years was measured on both cores from each tree, in the laboratory, with the aid of a microscope core-measuring device. Diameter growth, inside bark, was obtained by adding the two radial measurements. The average diameter increment was computed for each age and vigor class. The difference between growth rates of age and vigor classes were found to be significant as will be shown later. The bark and crown descriptions were analyzed for each age and vigor class and Keen's descriptions modified as found necessary to apply to the local characteristics of Black Hills ponderosa pine.

The modified tree classification was then applied to trees in a number of stands that had been selectively cut 25 years before. To each tree was ascribed the age and vigor class which it was estimated to have had at the time of cutting. The diameter growth, inside bark, for the 25 years subsequent to cutting was determined from increment cores as described for the uncut stand. A comparison of diameter increments of age and vigor classes for both uncut and selectively cut stands was made.

TABLE 1.—AVERAGE D.B.H. INCREMENT, INSIDE BARK, IN INCHES BY AGE AND VIGOR CLASSES OF BLACK HILLS PONDEROSA PINE IN UNCUT STANDS. EACH AVERAGE IS BASED UPON 20 TREES IN EACH AGE AND VIGOR CLASS

	Vigor class			
Age class	A Inches	B Inches	C Inches	D Inches
1	3.64	2.50	1.68	1.48
2	2.72	1.92	1.42	1.13
3	1.72	1.26	0.99	0.74
4	1.16	0.79	0.52	0.40

Results

The average d.b.h. increment, inside bark, for the 25 years, 1911-1935 inclusive, was computed for each of the age and vigor classes for the uncut stand and is given in Table 1 and Figure 1. An analysis of the variance of the diameter increment within and between age and vigor classes is given in Table 2. The F[2] value of 22.25 for the variance between diameter incre-

TABLE 2.—ANALYSIS OF VARIANCE OF MEAN D.B.H. INCREMENT IN INCHES FOR A 25-YEAR-PERIOD (1911-1935 INCLUSIVE) OF 320 PONDEROSA PINE TREES OF UNCUT STANDS CLASSIFIED ACCORDING TO KEEN'S SYSTEM

Source of variation	Degrees of freedom	Sum of squares	Mean square	F	Significance
Total	319	292.79	0.92	......	......
Within classes	304	69.22	0.23	......	......
Between means of age-classes	3	118.79	39.60	22.25	High
Between means of vigor classes	3	88.79	29.60	16.63	High
Interaction	9	15.99	1.78	7.74	High

[2]F, is a measure of significance. See (7).

[1]The average number of years for ponderosa pine seedlings to attain a height of 4½ feet was determined as a phase of a growth and yield study by counting the annual rings at the root collar of 720 open grown seedlings in selectively cut stands.

ments of the 4 age-classes is highly significant (7). An F value of only 6.99 indicates that only once in 100 similar sets of observations would such a difference as shown here be likely to occur by chance. Both the variances, that between mean diameter increments of vigor classes and that of interaction of age and vigor, are highly significant as indicated by the F values of 16.63 and 7.74 respectively. These results imply that the observed differences in diameter growth within and between age and vigor classes are probably the result of true differences in rates of diameter growth rather than the result of chance variation.

Table 3 and Figure 2, show the average d.b.h. increment, inside bark, by age and vigor classes for a 25-year-period, 1911-1935 inclusive, of 653 trees growing in a number of selectively cut stands. Since they show a similar differentiation in growth rates by age and vigor classes, excepting for that between age classes 1 and 2, no analysis of variance was made. Trees of age classes 1 and 4 were scarce in the cut-over stands studied.

It is readily seen (Table 3) that the growth rates of age-classes 1 and 2 in the selection stand are similar. This may be the result of one or more factors or a combination of them. First, the number of trees upon which the averages for age-class 1 are based is small. Secondly, the trees of age-class 1 may have had all the light, nutrient substances, and soil moisture that they could utilize before the cutting. It should be remembered that before a tree can be released by a cutting it must be in actual competition with the tree or trees cut. Third, errors may have occurred in estimating what the age or vigor classes were at the time of cutting, and this procedure undoubtedly resulted in some errors.

A comparison of the average diameter increments for a 25-year-period, in uncut and selectively cut stands, (Figures 1 and 2) indicates that the release of a tree in age-classes 2, 3, and 4 by a selection cutting has the average general effect of accelerating the growth rate equivalent to that of trees in an uncut stand having the same vigor class but one age class younger. This does not mean, however, that the growth rate of trees of C and D vigor is sufficient to warrant their retention in the reserve stand in place of trees of A and B vigor. It has already been pointed out that trees left in the reserve stand are an investment from which maximum returns are desired. It is apparent (Figure 2) that the value of dividend returns in the form of increased growth is much greater from trees of A and B vigor than from those of C and D vigor.

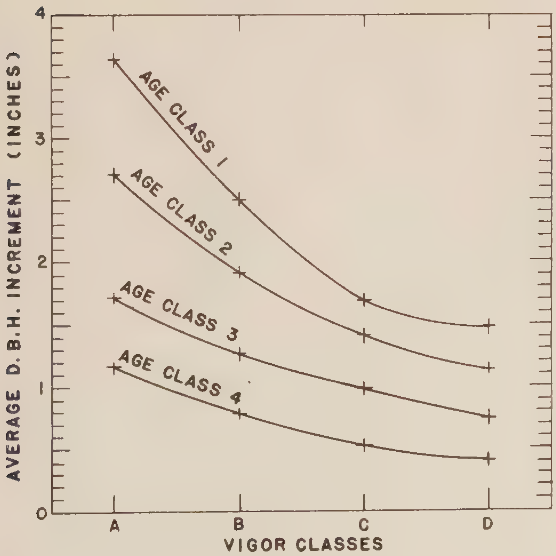

Fig. 1.—Average diameter increment, inside bark, by age and vigor classes for a 25-year-period (1911-1935) of Black Hills ponderosa pine in uncut stands. Each average is based upon 20 trees.

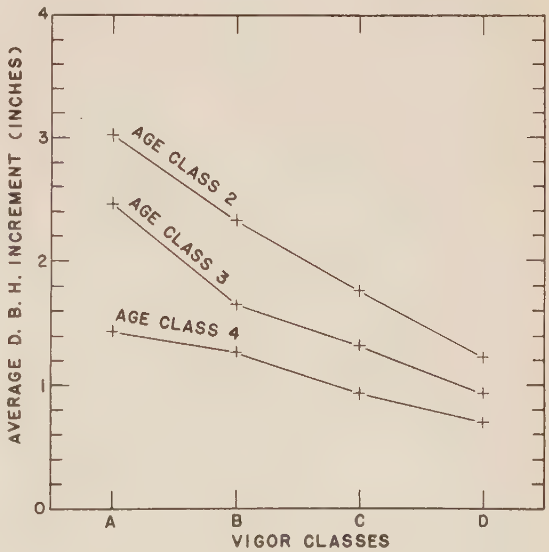

Fig. 2.—Average diameter increment, inside bark, by age and vigor classes of Black Hills ponderosa pine for a 25-year-period (1911-1935) following release by a partial cutting.

Description of Keen's Classification Modified to Apply to Growth Capacities of Black Hills Ponderosa Pines[3]

Age Groups

Trees are first divided into the four general age groups of young, immature, mature, and overmature. On the average site of ponderosa pine in the Black Hills of South Dakota and Wyoming, the characteristics of each of these groups are as follows:

Age Class 1. Young trees—commonly referred to as "blackjacks"; usually less than 75 years of age.
- D.b.h.: Rarely over 10 inches.
- Tops: Usually pointed, but may be rounded when open grown; making good height growth.
- Bark: Rough, fissured, dark-brown to black.
- Branches: Upturned and in whorls.

Age Class 2. Immature trees—age approximately 75 to 150 years.
- D.b.h.: Rarely over 16 inches.
- Tops: Usually pointed, open grown trees may have rounded tops, trees still making height growth.
- Bark: Fissured, usually dark brown to reddish brown, yellowish tinge showing at bottom of fissures, occasionally reddish brown or yellowish plates forming at the base.
- Branches: Usually upturned and in whorls.

Table 3.—Average d.b.h. Increment, Inside Bark, in Inches by Age and Vigor Classes of Black Hills Ponderosa Pine Released by a Partial Cutting 25 Years Before Measurement (1911-1935 Inclusive) and the Number of Trees Upon Which the Averages are Based

	Vigor class A		B		C		D	
Age class	Number	Inches	Number	Inches	Number	Inches	Number	Inches
1	8	3.01	25	2.29	5	1.95	3	1.02
2	63	3.01	163	2.32	122	1.76	29	1.23
3	26	2.46	99	1.65	56	1.32	18	0.94
4	2	1.44	22	1.27	10	0.94	2	0.70

[3]Grateful acknowledgment is made to F. P. Keen of the Bureau of Entomology and Plant Quarantine for the use of material from the descriptions of his tree classification and for the use of his chart of age and vigor classes.

Age Class 3. Mature trees—approximately 150 to 300 years old.
- D.b.h.: Rarely over 28 inches.
- Tops: Usually rounded or still pointed, although height growth practically ceases at about 160 to 170 years.
- Bark: Usually yellowish brown up to or above first 16-foot log, moderately sized plates between fissures; upper bole light reddish brown; on some exposures yellowish brown bark is scaly, fissures faint or entirely absent.
- Branches: Incomplete whorls, nodes indistinct; nearly all branches horizontal (occasionally drooping) with lower ones drooping.

Age Class 4. Overmature trees—usually over 300 years old.
- D.b.h. Usually of larger size, however diameters of age-class 3 and 4 overlap.
- Tops: Usually flat, occasionally rounding, sometimes spiked, making no height growth.
- Bark: Light yellow in color, plates wide, long, and smooth, although on some exposures the bark has scaled off until fissures are faint or nearly absent.
- Branches: Mostly drooping, gnarled or crooked.

Vigor Groups

The size of crown and abundance of foliage are probably the best outward indicators of the relative vigor of different trees of a given age. Therefore, each age class was further subdivided into four sub-groups based upon relative crown vigor. These are designated by letters *A* to *D*. The position of the tree in the stand in the following descriptions is for uncut stands. The positions may be entirely changed in a cut-over stand; however, the other criteria of vigor are readily recognized.

A. Full vigorous crowns with a length of 55 percent or more of the total height and of average width or wider; foliage usually dense; needles long and dark green; position of tree isolated or dominant (rarely codominant).

B. Fair to moderately vigorous crowns with average width or narrower, and length less than 55 percent of the total height; either short wide crowns or long narrow ones, but not sparse or ragged, may be flat on one side, position either

Courtesy of F. P. Keen

Fig. 3.—A ponderosa pine tree classification chart for determining relative growth capacity based on age and vigor.

dominant or codominant but sometimes isolated.

C. Fair to poor crowns, usually flat on one or more sides, very narrow and sparse or represented by only a tuft of foliage at the top; foliage usually short and thin; position usually intermediate, sometimes codominant, rarely isolated.

D. Crowns of very poor vigor; foliage sparse and scattered or only partially developed; diameters decidedly subnormal considering age; position suppressed or intermediate.

Figure 3 is a tree classification chart for determining growth capacity of Black Hills ponderosa pine based on age and vigor classes.

Application to Timber Marking

Rules for timber marking of necessity must be flexible to fit varying conditions of stand character and lumbering requirements. Observance of the following suggestions for timber marking may be of assistance to the beginner. Their use should result in silviculturally improved reserve stands whose yields may be increased as a result of a better growing stock.

Age Class 1. Trees should seldom be cut except for poles, posts, and props, and these should be in the form of a thinning by removing vigor classes *C* and *D*.

Age Class 2. Leave trees of vigor class *A* and *B*. If trees of *C* and *D* vigor must be left in reserve stand they should be released as much as possible.

Age Class 3. Mark all trees of *C* and *D* vigor of merchantable size. Additional cutting for poles, posts, props, ties, and fuelwood should remove trees of these vigor classes that are undesirable for sawtimber. Trees of these classes are a poor investment and should be removed so that space they occupy may be utilized by younger trees of greater growth capacity. Leave trees of *A* and *B* vigor excepting when needed to fill out required volume of sawtimber.

Age Class 4. Cut all trees in this age class except when needed for seed trees. In such instances reserve trees should be of *A* or *B* vigor.

Exceptions to the above rules should be made in the case of *A* and *B* trees having fire scars, cat faces, injuries due to lightning, porcupines, mechanical agencies, crook or sweep, and those having external evidence of being infected with western red rot (*Polyporus Ellisianus* (Murr.) Long).

Summary of Results

1. Keen's tree classification, as modified, is a satisfactory criterion of the relative growth capacities of Black Hills ponderosa pine, either in uncut or in selectively cut stands.

2. The mean difference in diameter growth between age classes and between vigor classes is highly significant.

3. By vigor classes, the highest mean diameter growth is made by trees of *A* vigor, followed in descending order by trees of *B, C,* and *D* vigor. By age-classes, the highest mean diameter growth is made by trees of age class 1, followed in descending order by trees of age classes 2, 3, and 4.

4. In general, the effect of average release by a selection cutting on diameter growth is to accelerate the growth rate equivalent to that of trees in uncut stands having the same vigor class but one age-class younger.

5. Suggestions are made for applying a tree classification to timber, which if followed should result in silviculturally improved reserve stands whose yields may be increased as a result of a growing stock of high growth capacity.

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BRIEFER ARTICLES AND NOTES

Faculty Changes at the Yale School of Forestry

Announcement has been made of a number of promotions and appointments in the Yale School of Forestry, effective July 1. These staff changes have been occasioned by the retirement of Dean Henry S. Graves and the death of Prof. Ralph C. Bryant. As previously announced, Prof. Samuel J. Record has been named as dean of the School. He will also carry the title of Pinchot Professor of Forestry.

George A. Garratt, associate professor of forest products, has been appointed manufacturers' association professor of lumbering, to fill the vacancy created by the death of Prof. Ralph C. Bryant. Professor Garratt graduated from Michigan State College in 1920 and received his M.F. degree from Yale in 1923 and his Ph.D. degree in 1933. He has been engaged in teaching and research in the fields of wood technology and wood utilization for the past nineteen years, and served as instructor in forestry at Michigan State College and as professor of forestry and engineering at the University of the South, prior to becoming assistant professor of forest products at Yale in 1925. He was promoted to his present post in 1931, and since 1936 has also been assistant dean of the School of Forestry. Professor Garratt is the author of *Mechanical Properties of Wood* (1931) and coauthor of *Wood Preservation* (1938), both standard text and reference books for college and industrial use, and has written numerous technical articles in his chosen fields. He has been a member of the editorial staff of the Yale Forest School *News* for the past thirteen years, and editor and manager since 1935.

Harold J. Lutz has been promoted to associate professor of forestry, in recognition of his attainments in the fields of forest ecology and forest soils. Professor Lutz graduated from Michigan State College in 1924 and was granted the M.F. degree from Yale in 1927 and the Ph.D. degree in 1933. He served for three years with the U. S. Forest Service, as technical assistant in Alaska and as associate silviculturist at the Allegheny Forest Experiment Station, and spent one year as assistant forester at the Connecticut Agricultural Experiment Station, prior to becoming assistant professor of forestry at Pennsylvania State College in 1929. In 1933, he was brought to Yale, as assistant professor of forestry, to fill the vacancy created by the death of Prof. James W. Toumey. Professor Lutz has established an outstanding reputation through his work in forest soils, and is the author of several bulletins in the Yale School of Forestry Series and numerous research papers published in various scientific journals.

Walter H. Meyer, professor of forest management at the University of Washington, has been appointed associate professor of forestry, to fill the teaching vacancy created by the retirement of Dean Graves. He will carry the courses in forest economics and forest policy, as well as advanced work in forest mensuration and statistics as applied to forest research, in which fields he has attained a position of outstanding prominence. Professor Meyer graduated from Yale College in 1919 and received his M.F. degree from Yale in 1922 and his Ph.D. degree in 1928. During the year 1923-24 he studied at the Royal Institute of Forestry in Sweden, under an American-Swedish Fellowship grant. He spent thirteen years with the U. S. Forest Service, engaged in research in the fields of forest mensuration and forest management, chiefly at the Pacific Northwest Forest Experiment Station, before being appointed to his present post at the University of Washington in 1935. He is the author of numerous scientific publications in his special fields of interest, including five technical bulletins of the U. S. Department of Agriculture and one bulletin in the Yale School of Forestry Series.

Robert T. Clapp has been promoted to assistant professor of forestry, on the Charles Lathrop Pack Foundation, and will serve as director of the Yale Forests and of the summer term of the School of Forestry, as well as giving instruction during the regular college year. Professor

Clapp received his B.A. degree from the University of Pennsylvania in 1929, and his M.F. degree from Yale in 1933. He served for approximately two years with the U. S. Forest Service, and was brought to Yale in 1934, as instructor in applied forestry. In 1937, he was made instructor, in charge of the Yale Forests at Union, Conn., and Keene, N. H., and during the past two summers has been in charge of the school's summer camp on the Union Forest.

Robert W. Hess, assistant professor of forestry at the University of Maine, has been appointed assistant professor of forestry products, to fill the vacancy resulting from Professor Garratt's promotion to professor of lumbering. Professor Hess received his B.S. degree from Iowa State College in 1934 and his M.F. degree from Yale in 1936, following which he spent a postgraduate year at Yale under an American Creosoting Company Fellowship grant. He has had two years of experience with the U. S. Forest Service and the Soil Conservation Service, and spent approximately a year as instructor in forestry at the University of Arkansas, before accepting his present position at the University of Maine in 1938.

Wringing the Neck of the Pacific Coast Wood Goose

Foreign countries are annually taking up to 132,000,000 feet of our Douglas fir logs, shortening the life of our virgin timber resources and depriving American industry of raw material and American labor of employment opportunities. This exportation of our logs is a serious threat to private reforestation enterprises, and suicidal from every point of view.

For the past few years foreign countries have drawn upon the Pacific Northwest virgin forests to supply an annual average of about 80,000,000 feet of Douglas fir logs. These logs are to a great extent used for the manufacture of plywood in foreign countries. They represent the cream of the North Pacific Coast forests. The timber is from 200 to 700 years old and cannot be secured from any other part of the world. It is this timber which is the greatest asset of the Northwest, and once it is cut out, it can never be replaced.

It is on the basis of these timber resources that the Northwest plywood and other forest industries have been developed. It is also on the basis of this natural advantage that this region is paying the highest wages of any comparable industry anywhere. Loggers are disposing of fir peeler logs to the Northwest plywood industry at $30 to $35 per thousand feet. This represents about 30 percent higher prices than any other log-buying industry can afford to pay. The reason is the close utilization of the raw material as effected by the plywood industry.

Those advocating commercial reforestation in the Northwest have naturally relied on the sale of peeler logs for a large share of reforestation costs. On the other hand this ever increasing exportation of fir logs will not only oppose these plans, but will also deprive the domestic industry of needed raw material and Northwest labor of an opportunity for employment. The present situation is serious since partly on account of this log export the Northwest plywood industry has operated on a reduced basis with consequent unemployment in the ranks of plywood labor. At the same time Japan, Germany, Italy, Australia, and many other countries are manufacturing Douglas fir plywood from American logs, selling their products on the international market at low prices, which the American industry cannot meet. This exportation of Douglas fir logs in reality, means the giving away to foreign countries the opportunity of employment of labor so sorely needed in the Northwest and hastening the day of exhausting our virgin timber resources.

Foresters are naturally keenly interested in the conservation angle, and it is obvious that by conserving these virgin timber stands and reserving the supply for our own industries, we would automatically further the cause of reforestation in more ways than one. At the present time and for some time past, there has been an oversupply of ordinary sawlogs and pulp logs. This is, to some extent, due to the cutting of peeler log timber. Under present logging practices the surrounding timber must be cut as well. Consequently, the entire economic aspect of the logging industry in the Northwest has suffered.

This case has no parallel in any industrial country of the world where a country having a practical monopoly on the raw material supply is permitting an unrestricted exportation which in turn leads to the building up of foreign industries and a corresponding decrease to the domestic industry and the employment of labor. When one takes into account that in the production of a ton of peeler logs for export only $2 worth of labor is involved, while in a ton of ply-

wood manufactured from the same logs the labor item is $25, one readily realizes how important this log export matter has become.

To illustrate this point, it may be mentioned that until a few years ago Germany imported every year increasing quantities of Douglas fir plywood from this country, reaching a large total of 12,000,000 feet. Suddenly Germany prohibited the importation of the American article and instead changed over to the importation of Douglas fir peeler logs and made payment in the form of wire rope, machinery, and sawmill equipment. In this manner Germany did not only deprive the American plywood workers of employment, but it also, through this barter arrangement, displaced American labor in other fields. Italy, formerly an important market for our plywood, has now prohibited its importation. Other countries have placed prohibitive duties on American plywood because the logs were available, but at the same time other countries refusing to sell logs have been given every facility for the supplying of plywood.

There is only one solution, viz., to pass a law prohibiting the exportation of Douglas fir peeler logs for the purpose of protecting American trade, American labor, and most important of all, to string out the remaining supply of virgin timber so important for the financing of future reforestation enterprises.

Axel H. Oxholm,
Pacific Forest Industries.

Increment Core Handling

Increment borer cores are so fragile that their handling in the field presents constant problems. No less difficult is their handling in the office when they are being studied. To make both problems simpler the author planned the carrying "book" illustrated in Figure 1. Several were made up by his assistant, George Jenkins, who improved upon the original specifications.

The book consists of two grooved sugar pine boards and a heavy cardboard separator, all three hinged as shown. The boards measure $^5/_{16}$ inch by 4 inches by 10 inches each. The length is increased ¾ inch by the addition of ⅜ inch thick cleats, one at each end. These cleats serve to strengthen the boards and to stop the grooves at their ends. The grooves were cut on a circular saw. They are wide enough to hold the cores tightly enough to prevent their falling out when the book is opened, yet loosely enough that they may be withdrawn without much danger of breakage, and deep enough to prevent the cores projecting above the surface. The brass hinges are of the table-top type. The original pins were removed and replaced with a brass wire, long enough to reach from one hinge through the next, thus to serve as a continuous pin to which the cardboard separator is attached, permitting it to swing independently of the boards. Gummed cloth tape is used to bind the separator to the hinge pin. If hinges like those illustrated are not available, the two boards may be bound together with gummed cloth tape, and the separator bound in with the same material, being careful that the gum holds well to the wood. One book so built has been found quite satisfactory.

The separator material should be dense and non-absorbent. If not moisture proof it should be shellacked, otherwise the wet cores will cause the cardboard to swell and possibly stick to the cores.

The end cleats should extend above the grooved surface one half the thickness of the separator, so

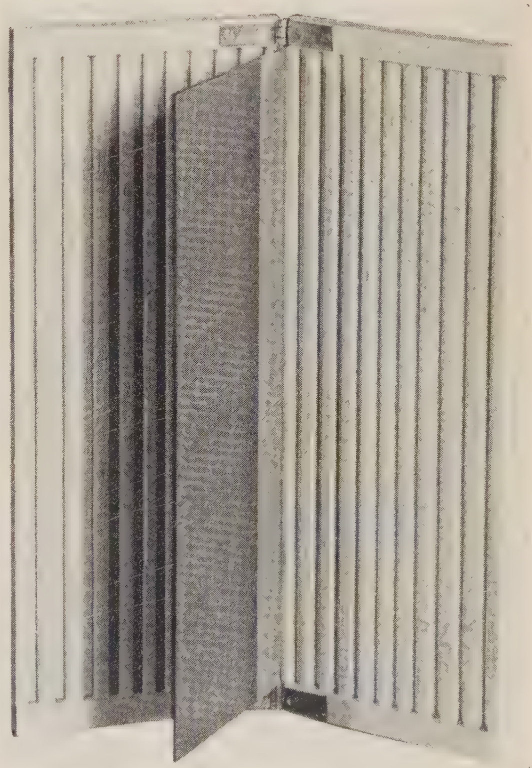

Fig. 1.—Increment core field book.

that when the book is closed, the separator will not spring the hinges and prevent snug closure. A heavy rubber band suffices to keep the book closed.

The books were found to be very handy for pocket use in the field, preventing loss and breakage and making examination easy. In the office it was found that the cores need not be removed to make necessary measurements.

Cores are numbered in the field and while still moist with an indelible pencil. The thin blue "leads" in mechanical pencils are equally satisfactory, but the numbers should be written on an end-grain side to reduce the chance of the color diffusing and blurring.

Sometimes, there is so little contrast between spring and summer wood that it is difficult to distinguish between growth rings. It was found that the contrast could be enhanced by pressing the dried core, while held in a grooved block, against a swiftly moving disc sander, applying enough pressure to raise sufficient heat to "burn" the wood. Summer wood burns to a deeper shade than the spring wood, making the rings clearly distinguishable. The block should be an inch longer than the core and about one inch square. The groove should hold the core tightly and should allow about $^{1}/_{16}$ inch to project.

Whenever possible measurements should be made before the cores dry out, particularly in the case of woods inclined to distortion during shrinkage.

Emanuel Fritz,
University of California.

The Decagon for Vegetation Studies

In range research the determination of density of vegetation has always been somewhat of a problem, and numerous devices and methods have been developed and used with varying degrees of success. On small areas where a few plots serve adequately to determine the density changes, such devices as the chartograph, density square, density rule, and densimeter have proved to be very satisfactory. But where large areas must be covered, as in forage-management and range-capacity studies, the devices named are too time consuming to be of much practical value, hence one resorts to estimates. Various methods for making estimates have been tried on the Santa Rita Experimental Range.[1] Thus far the decagon frame has been found best, especially where several kinds of plants make up the ground cover, as is common on most semidesert mixed-grass ranges.

Fig. 1.—Decagon for use in estimating ground-cover density; 10-square-foot size.

The Decagon

In principal, the decagon method is similar to the square-foot-density method described by Stewart and Hutchings,[2] except that instead of being round, the plots are the shape of a regular decagon. The decagon is made in two sizes: one of 10 square feet (Fig. 1, *A*) and the other of 100 square feet (Fig. 1, *B*). Whether small or large it is divided into 10 equal triangular segments by means of spokes that radiate from a hub. Each segment is graduated into 0.1-square-foot areas by means of alternately colored bands on the spokes. The frame of the small one is made in one piece, whereas the large one is made in five sections; each section consists of two 10-square-foot segments. The sections are so constructed that they can be easily clamped together in the field, and thus make a complete decagon. The hub has a hole large enough to fit a ⅝-inch round iron stake, thus making pos-

[1]Branch of the Southwestern Forest and Range Experiment Station near Tucson, Ariz.

[2]Stewart, G., and S. S. Hutchings. Point-observation-plot (square foot density) method of vegetation survey. Jour. Amer. Soc. Agron. 28:714-722. 1936.

Fig. 2.—Estimating density with a decagon. Left, too much growth for a close estimate; middle, grass clipped to within 1 inch of the ground is best for close estimates; right, visualizing how much area would be covered if all the grass within the segment were in the triangle next to the hub.

sible the use of the decagon on either temporary or permanent plots that are marked with center pins. On permanent 100-square-foot plots, one may use a frame that comprises a single 10-square-foot segment by revolving it, a segment area at a time, around the center pin.

RECORDING PROCEDURE

Experience has shown that within certain limits, the smaller the plot, the easier it is to obtain accurate estimates of density. With the decagon, the density enclosed by each segment is estimated separately. The operator visualizes the plants as all crowded together in the angle next the center hub, and then estimates, by means of the bands on the spokes, the number of square feet, or fraction thereof, covered by vegetation (Fig. 2). Incidentally, it was found that much greater accuracy may be obtained after the grass is clipped to within 1 inch of the ground. The total estimated density thus obtained is then broken down and credited to the various species. Where densities are low, as in much of the semi-desert region, it was found most practical to make the density estimates in thousandths of a square foot, that is, 0.1 of a square foot is recorded as 100 (thousandths) and 0.6 of a square foot, as 600 (thousandths), etc. In final summarization of results, the decimals may be put in to show the percentage of ground cover. Aside from a greater degree of accuracy, the decagon has an added advantage from a statistical point of view in that each plot provides 10 samples instead of one. Although this method is somewhat slower than the square-foot-density method, for research it seems that the extra time involved is amply justified by reason of greater degree of accuracy.

APPLICATION

Largely because of the increased time required this method is not recommended for administrative surveys. However, it does appear to have a place in many research studies where a certain degree of accuracy must be observed and where the results, if they are to be of any real value, must show commonly, minor changes in density of each of the various species. In making pasture surveys, where a considerable number of temporary plots are located at random over the range, the 10-square-foot decagon has proved to be very successful. In more intensive and localized studies, the 100-square-foot decagon may be used, and densities either estimated in the usual way or actually measured with a densimeter. Obviously, the decagon is not satisfactory where large rocks or shrubs are encountered. It gives best results with grass and low-growing shrubs.

MATT CULLEY,
Southwestern Forest and Range Expt. Station.[3]

[3]Maintained at Tucson, Ariz., by the U. S. Forest Service, in cooperation with the University of Arizona, and covering Arizona, New Mexico, and western one-third of Texas.

Four New Products Made From Lignin in Wood Waste

By adding hydrogen to lignin scientists of the Forest Products Laboratory at Madison, Wis., have learned how to convert this waste product of wood into products that bear promise of being valuable raw materials with many uses.

One is a well-known product—methanol, or wood alcohol. Four others had not been previously discovered, although one of the group was described as theoretically possible by a German scientist. The properties of these new substances are such as to suggest their use as wood preservatives, fungicides, insecticides, adhesives, solvents, and plastic materials.

The co-discoverers, Dr. E. C. Sherrard and Dr. E. E. Harris, describe the first new substance as parapropylcyclohexanol, valuable as a solvent for organic gums and resins, and oils used in lacquers. It has value as a preservative, and is about as repellent to insects as creosote. The second and third substances, described as 4-propyl, 1, 2-dihydroxycyclohexane and 3-p-hydroxycyclohexylpropanol, are thick liquids which become solid after standing a long while. Both may be made into plastic materials.

The fourth substance is crystalline and unnamed, as the discoverers have not yet determined the positions of the carbon, hydrogen, and oxygen atoms of which it is composed. The names of the first three substances are the chemical key to their atomic structure, or structural formula. The empirical formula, or number of atoms regardless of structure, of the fourth substance is $C_{18}H_{33}O_3$. It has properties that make it valuable as a lacquer ingredient and, because of its water-resistance, as a cement or adhesive for wood, paper, metal, and other materials. It also may be used as a plastic material.

As a by-product of paper and industrial cellulose mills, about 1,500,000 dry-weight-tons of lignin are dumped in streams each year, making it a pollution and disposal problem as well as one of waste. The cellulose, or wood cells, is used in making paper and rayon and is now the most important wood constituent from a chemical conversion standpoint. The cementing substance in and around the cells is lignin. Roughly, it composes one-fourth of the structure of all fibrous plants, including trees. It is necessary to separate the lignin before cellulose can be used.

Because of its complex chemical nature, lignin in its natural form has baffled scientists. By submitting it to the hydrogenation process the U. S. Forest Service scientists changed its chemical nature so that it could be broken down into component parts. The hydrogenation process already is in use commercially in making hard fats from vegetable oils, in making petroleum oils from coal, and in getting phenomenal yields of gasoline and gas oils from natural petroleum.

In the laboratory tests the hydrogen atoms were added to a solution of purified lignin by means of heat and pressure and the use of a catalyst—copper chronium oxide—another chemical inducing rapid reaction, yet taking no part in it. Under this treatment the dirty, brown lignin solution changed to a thick, sticky, and colorless fluid. The catalyst was removed by the use of a centrifuge, which works on the principle of a cream separator. The residue was then distilled, or fractioned, to create the wood alcohol and the four new substances.

Waste lignin from pulp plants using the sulphate, sulphite, soda, and nitric acid processes, after pretreatment to remove impurities, may be converted into the new substance by the new process which has been patented and assigned to the Secretary of Agriculture.

An Extension Rod for Measuring Tree Heights

Kienholz[1] and McNeill[2] in recent notes have described rods for measuring tree heights in dense plantations, and have enumerated the advantages and disadvantages of the pole method as compared with the use of the Abney level or the hypsometer. The chief requirements of the measuring rod, as Kienholz has pointed out, are lightness, portability, ease and speed of operation, strength and rigidity, and cheapness of construction.

While assisting in plantation studies[3] in New England in 1931 the writer developed a measuring rod which was used under widely varying conditions with satisfactory results, and which has recently been duplicated for plantation stud-

[1]Kienholz, R. A jointed pole for measuring tree heights. Jour. Forestry 35:411-13. 1937.

[2]McNeill, W. M. A telescopic measuring mast. Jour. Forestry 35:1064-65. 1937.

[3]Under the direction of Northeastern Forest Experiment Station. Acknowledgment is due Dr. Guy R. Stewart for helpful suggestions offered during the construction of the original rod.

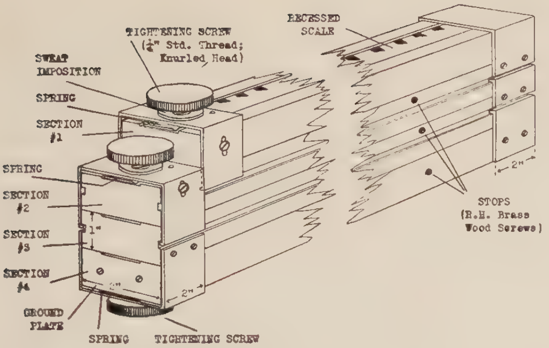

Fig. 1.—Construction details of an extension rod for measuring tree heights.

ies in Pennsylvania. The rod consists of four 8-foot sliding sections; each section is secured to the adjoining one by means of clamps and grooves, somewhat on the order of a surveyor's leveling rod. The two upper sections are of yellow poplar, the lower two of hard maple. The total weight is eighteen pounds, but might be reduced to approximately fifteen by sacrificing strength for lightness and using yellow poplar wood exclusively.

In use, the rod is placed beside the bole of the tree and extended, a section at a time, securing each section at its extended height by tightening the knurled screw at its base. A graduated scale is stamped on the recessed face of the rod and is so arranged that the height of the tree may be read directly, at the base of the section last raised. Stop screws are placed against the side channels near the end of each section to insure adequate overlapping when the rod is extended. This overlapping must be taken into consideration when the scale is stamped on the rod. Stamping may be facilitated by using small rubber numerals from the toy or stationery store, and black stamping ink. Appearance and legibility are improved if the recessed face of the rod is painted white prior to the stamping operation. When thoroughly dry the scale may be finished with waterproof lacquer. The sides and channels of the sections are then given several applications of boiled linseed oil. The construction details of the rod are shown in Fig. 1.

The chief advantages of this type of rod are its compactness and the ease and speed with which the readings can be taken. When closed, the rod can be carried inside the average sedan or delivery type truck. Cost of materials is low; ⅛ x 2 inches flat brass is used for the clamps, cold rolled brass rod for the tightening screws. Spring bronze or ordinary thin guage brass may be used for the springs, which are riveted inside the clamps and prevent the tightening screws from disfiguring the face of the rod. Cost of construction may vary considerably according to the availability of machine-shop facilities.

John E. Hetzel,
Allegheny Forest Experiment Station.

A Hardwood Record

In the winter of 1917-1918 there was an acute shortage of coal in upstate New York. Cordwood prices rose sharply and many woodlots were sacrificed. Merton Colby, a prominent farmer in Monroe County, had a five-acre woodlot of mixed hardwoods growing on Ontario loam soil not far from Lake Ontario. The entire stand was clear cut, yielding approximately 100 standard cords of fuelwood. This stand consisted chiefly of white ash, red oak, sugar maple, beech, bitternut hickory, and elm. As far as the owner can recall, these trees ranged from ten to fifteen inches in diameter on the stump.

Since the area was excellent agricultural soil, Mr. Colby had in mind removing the stumps and adding the woodlot area to the adjacent fertile fields. In the press of other duties this intent was not accomplished and nature was allowed to take her course. In the fall of 1938 the writer visited the woodlot and took a record of the stand that followed the clear cutting in a section that seemed to represent average conditions as to stocking and growth. A quarter-acre circular plot was carefully laid out. All trees two inches and over d.b.h. were measured and tallied by species.

The average height of the dominant white ash, white elm, basswood, tulip poplar, bitternut hickory, and red oak was fifty feet. Using the volume table on page 35 of Yale Bulletin 17, *Studies in Connecticut Hardwoods* this quarter acre plot contained 754 cubic feet. This is equivalent to 2,916 cubic feet per acre; a yearly growth rate, be it noted, of 146 cubic feet, or the equivalent of about two standard cords.

It is interesting to note that in Frothingham's bulletin on white pine[1] the yield for age twenty on site quality I is 2,100 cubic feet. The hardwoods on this site showed a greater volume by some 800 cubic feet per acre.

[1]Frothingham, E. H. White pine under forest management, U. S. Dept. Agric. Bull. 13. 70 pp. 1914.

Several other facts in regard to this stand are worthy of comment. With the exception of the basswood all the trees on the plot are of seedling origin. Basswood stumps are well known for their sprouting vigor, and in this plot these basswood clumps accounted for most of the seven-inch, and all of the eight-inch trees, as well as the ten-inch tree. Over sixty of the basswoods, however, are of seedling origin. Those who are familiar with the behavior of red oak in young even-aged stands will not be surprised to note that this species shows such a remarkable diameter growth rate. The unusual feature of this stand was the even faster growth rate shown by white elm. It is only explained by the fact that the site is quite moist, though drainage is excellent. The high proportion of ash, 400 trees to the acre, all of seedling origin, is the most valuable feature of this remarkable woodlot. In fact the exceptionally high proportion of crop species resulting from such a clear cutting, while well known to all foresters practicing in New York State, is perhaps nowhere better exemplified.

In the sprout hardwood region of New York, red oak, white ash, basswood, black cherry, and bitternut hickory are considered the most valuable species. All are represented in the area, though on the particular plot black cherry was not found. In addition there is a generous scattering of tulip poplar throughout the stand, showing the ameliorating effect on the climate of nearby Lake Ontario. In an adjoining 80-year old woodlot, there are some splendid sixteen-inch tulip poplars, 75 feet high.

The trembling aspen and bird cherry, so common in our stands following clear cutting, show in this area scarcely more than a trace. Though the inevitable crop of briars came in immediately after the 1917 operation, the better hardwoods sprang up so quickly that these two temporary species had little chance to establish themselves.

THINNING THE PLOT

"In dense even-aged stands, when the length of live crown is less than one-quarter of the total height of the tree," say the Danish foresters, "it's time to do something about it." In this particular stand with well over 800 dominants to the acre,

Table 1.—Tally of Trees on a ¼-Acre Plot of a 20-Year Old Stand in New York

D.b.h.	R.O.	Ba.	W.A.	W.E.	R.E.	S.M.	B.C.	Be.	B.H.	T.P.	T.A.	Total
2	--	12	21	6	5	22	1	5		--	--	72
3	--	16	25	8	2	6	1	--	5	--	--	63
4	--	19	24	9	3	1	2	--	2	--	--	60
5	--	7	24	4	2	--	--	--	2	--	--	39
6	1	12	9	5	1	--	--	--	2	--	--	30
7	1	6	5	8	--	1	--	--	--	1	--	22
8	1	3	2	2	--	--	--	--	--	--	1	9
9	1	--	--	3	--	--	--	--	--	--	--	4
10	1	1	--	1	--	--	--	--	--	--	--	3
11	--	--	--	1	--	--	--	--	--	--	--	1
12		--	--	2	--	--	--	--	--	--	--	2
Total	5	76	110	49	13	30	4	5	11	1	1	305

Legend: R.O., red oak; Ba., basswood; W.A., white ash; W.E., white elm; R.E., red elm; S.M., sugar maple; B.C., bird cherry; Be., beech; B.H., bitternut hickory; T.P., tulip poplar; T.A., trembling aspen.

Table 2.—Thinning on ¼-Acre Plot of Hardwoods in New York

	R.O.		Ba.		W.A.		W.E.		R.E.		S.M.		B.H.		T.P.	B.C.	Be.	T.A.	Totals	
D.b.h.	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T	T	T	L	T
2	--	--		12	5	16	1	5	3	2	18	4	--	--	--	1	5	--	27	45
3	--	--	2	14	11	14	4	4	--	2	6	--	5	--	--	1	--	--	28	35
4	--	--	8	11	13	11	2	7	2	1	1	--	1	1	--	2	--	--	27	33
5	--	--	4	3	20	4	3	1	--	2	--	--	2	--	--	--	--	--	29	10
6	1	--	9	3	9	--	1	4	1	--	--	--	2	--	--	--	--	--	23	7
7	1	--	5	1	5	--	2	6	--	--	--	1	--	--	1	--	--	--	14	8
8	1	--	1	2	2	--	2	--	--	--	--	--	--	--	--	--	--	1	6	3
9	1	--		--	--	--	--	3	--	--	--	--	--	--	--	--	--	--	1	3
10	1	--	1	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	2	1
11	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	1
12					--	--	--	2	--	--			--	--		--	--	--	--	2
Total	5	--	30	46	65	45	15	34	6	7	25	5	10	1	1	4	5	1	157	148

Legend: L, leave; T, take.

the live crowns of many of the crop species were less than a fifth of the total height of the tree in length. What species should be favored, and how heavy should the thinning be? The first question was easily answered. White ash is the most valuable hardwood species in the state ($20 per M on the stump in this locality). The other crop species already mentioned must, of course, also be favored. White elm was the species against which the greatest discrimination seemed to be called for. While of fair commercial value for baskets in this fruit section, its crown habit of spreading over all other associates in the stand except red oak, marked it for elimination.

The question of how much to thin was not so easily answered. One must guard against sun scald, windthrow, and water sprouting in so dense a stand. Fortunately, white ash, the prize tree in this particular stand, is the least susceptible of our five crop species to these dangers. The red oaks were already so well crowned that they needed no help. There were enough seedling basswoods with crowns in juxtaposition, so that small groups could be left to fight it out. Even a small amount of thinning in basswood, is likely to produce a crop of water sprouts.

These, and many other factors passed rapidly in review as the marking problem was tackled. Table 2 shows the result of an hour's careful work.

Thinning[2] was done as far as possible from above (hence the heavy cutting in the elms). If the smaller understory trees would not live five years, they were taken too. This accounts for the heavy marking in the two, three, and four-inch basswood, for this species will not recover from suppression, it has been observed in dozens of similar instances. The understory beech was taken out for no special reason except that the writer has a particular aversion to this species in the average farm woodlot. And since there was to be a meeting in this particular woodlot after the marked trees were felled, it seemed best to be consistent in eliminating beech, even when present in so insignificant a quantity.

Many foresters are no doubt going to be shocked at the heaviness of the marking which took 148 trees from a quarter-acre plot, 48.5 percent by number and 43 percent by volume. For answer I can only say: "You are invited to visit this plot with me five years hence, when the error or soundness of my judgment will be patent to all. In the meantime, comments either private or public will be welcome."

J. A. Cope,
Cornell University.

[2]Since writing the above account the cutting on the demonstration plot has been completed. The owner furnished the following information concerning operations:

"The marked trees when felled and stacked gave 20 cords of 12-inch wood, valued at $1.50 per face cord, or $30. Processing costs, including felling, buzzing, and stacking amounted to $12, leaving a net return of $18 on the one-quarter acre plot. On an acre basis this is a return of $72."

The owner is now proceeding to thin the entire woodlot.

Root Response to Slash Pine Seedlings to Indolebutyric Acid

With the extension of forestry practice in the South, more denuded lands are being planted. Slash pine (*Pinus caribaea*), due to its rapid growth and the ease with which it can be handled, is a favored species regardless of the site on which it is to be planted. If planting stock could be produced having a deeper and more extensive root system at an early age of development, it would reduce the high mortality often occuring on these dry sites. The object of this experiment was to determine the effect of indolebutyric acid on the root development of slash pine. The treatment used was essentially identical to the procedure used by Watkins[1] on cuttings.

Nursery-grown seedlings were placed for 24 hours in five separate containers with enough liquid to cover the root system. The treatment consisted of one tap water control and four dilutions of indolebutyric acid, namely 10, 20, 40, and 80 parts per million parts of water. Because a previous experiment with cuttings had demonstrated that a short period of treatment with strong dilutions was more or less comparable to weaker dilutions and longer treatment, the period of treatment was not varied. After treatment the seedlings were removed from the containers and planted in a deep, moderately dry Norfolk sand. Ten seedlings were used in each series.

The seedlings were treated and planted January 14-15, 1938. On January 8, 1939, they were

[1]Watkins, J. V. Experiments with hormodin on tropical and semitropical plants. Florists Exchange, July 17, 1937.

Fig. 1.—Effect of indolebutyric acid on slash pine seedlings one year after treatment. The two seedlings on the left were treated with a solution of 10 parts per million; the two on the right with tap water.

higher concentrations are also more costly.

Zimmerman and Hitchcock[2] have shown that growth substances in general retard elongation of roots although they may induce new roots to be formed. In the case of this preliminary test, however, there seems to be definite evidence that the treated slash pine seedlings developed more extended root systems than did the untreated controls.

From a practical standpoint, treatment with indolebutyric acid should be economically possible. A solution having a concentration of 10 parts acid in one million parts of water, the optimum treatment in this experiment, can be used on four successive lots of trees (each lot remaining in the solution for 24 hours) reducing the costs of materials and labor to a minimum. The trees should be placed in the solution the day prior to planting. The following day the treated seedlings should be taken from the solution and planted.

Summary

Indolebutyric acid accelerated root growth on slash pine seedlings. The most noted effect upon the trees, one year after treatment, was the increased depth of the root system. Inasmuch as this was only a preliminary investigation, it will have to be conducted on a larger scale and over a longer period of time before the practical and economic value of the treatment of slash pine seedlings is demonstrated.

Donald K. Plank,[3]
University of Florida.

Table 1.—Effect of Indolebutyric Acid on Slash Pine Root Growth

Number of seedlings used	Indolebutyric acid in parts per million	Root development: Good[1]	Fair[2]	Poor[3]	Number dead	Percent survival
10	Control	3	2	2	3	70
10	10	8	1	0	1	90
10	20	7	2	0	1	90
10	40	7	1	0	2	80
10	80	5	3	1	1	90

[1]Good. Taproot 24 inches long plus with well-developed laterals.
[2]Fair. Taproot 16 inches to 23 inches long with few laterals.
[3]Poor. Taproot 15 inches long or less with very few laterals.

lifted and the extent of root growth was measured. These data are shown in Table I.

Although only a small number of trees were used in the experiment, the treated seedlings showed a higher percentage of survival than did the tap water checks.

Only three of the controls had good root development as compared to eight for the optimum treatment. At the higher concentrations, the solutions tended to have a toxic effect. The

[2]Zimmerman, P. W. and A. E. Hitchcock. The response of roots to "root-forming" substances. Contrib. Boyce Thompson Inst. 7:439-45. 1935.

Hitchcock, A. E. and P. W. Zimmerman. Effects of growth substances on the rooting response of cuttings. Contrib. Boyce Thompson Inst. 8: 63-79. 1936.

[3]Holder of a fellowship supported by the Boyce Thompson Institute for Plant Research cooperating with the Florida Experiment Station.

REVIEWS

Care of Forests and Cutting for Profit. By Herman Work and W. R. Gingerich. *39 pp. Illus. West Virginia Pulp and Paper Company, Covington, Va.; Piedmont, W. Va. 1939.*

This is a constructive pioneer effort by a large user of pulpwood to explain to pulpwood producers in its territory reasons for the increase in demand for pulpwood; what constitutes satisfactory pulpwood; how to peel it; how to plan pulpwood operations; how to avoid hauling damage to soft roads; how to eliminate unacceptable wood from pulpwood deliveries; and how it is measured. This is all done in a very clear and interesting manner with hardly a word wasted.

The second part of the pamphlet is devoted to a description of forestry methods within the reach of every careful forest owner. The key note is indicated by the following quotation: "Man, with his axe and saw, can improve almost any forest and if the woods are not too far from market, he can make at least wages, and perhaps a little profit, even while cutting trees that have no promise, and are preventing the growth of valuable trees." And further "Since Nature prefers slow changes, forest improvement should be gradual, for the sake of the trees as well as the pocketbook." This section explains what is growing stock; results of fire and fire protection; avoidance of beetle attack; and how it pays the pulpwood cutter and contractor "to give the other fellow a chance." Attention is also called to how waste time of the farmer can be utilized in cutting pulpwood when the farmwoods are kept in good condition, and the use of the forest in restoring waste land.

As a final touch of added interest, the process of transforming wood to paper is briefly described. This helps show the pulpwood grower his relative position in a great industry.

Altogether this pamphlet constitutes a sort of intimate introduction of the purchaser of wood to the producer of forest raw materials that every large consumer of wood as a raw material might well imitate, with adaptations, of course, to his own locality.

As a firm believer in the integration of saw-timber and pulpwood production according to methods universal in European countries and adopted by some large concerns in the South, the reviewer has only one suggestion for future revision. He believes it would be better for the pulp company to encourage saw-timber production along with the pulpwood in order that diversified wood-using industries may share tax burdens and contribute further to increase the income of forest landowners.

Burt P. Kirkland,
U. S. Forest Service.

The Plant and its Water Supply. By E. J. Salisbury. *Jour. Royal Hort. Soc. 62(10): 425-442. Illus. 1937.*

Foresters, particularly those engaged in nursery or planting work, will find this paper of great interest because of its meaty contents and the fluent style in which it is written. It is not a report on new, original work by the author, but a good compilation of up-to-date information on the relation between plants and their water supply, prepared for the use of practical men.

Although the author himself makes no such formal division, he discusses four general topics: What is water? How is water used by plants? How do plants obtain water? How can we control the plants' water supply?

A considerable part of the discussion concerns the chemical make-up of water and its importance to plant growth and development. He points out (1) differences in chemical structure of water produced from condensed steam, from melted ice, and that found in ordinary lakes and streams; (2) that ordinary water contains minute, but important, proportions of at least two isotopes of hydrogen and oxygen; and (3) the variation in water in content of various common salts and traces of the rarer elements such as boron, vanadium, and others. In an interesting way he points out what is known as to the effect on plants of these variations in water and some of the theoretical implications not yet demonstrated in practice. He illustrates further the important part that water plays as a swelling agent

in imbibition in addition to its well known and highly important role as a solvent.

Much of the discussion on the plants obtaining water covers points generally known to foresters, such as the effects of soil texture, moisture conditions, and aeration. Some less known facts are: (1) Cold water is not absorbed as rapidly as warm water, but if the temperature of the water is above 50° F. it may stimulate carbon dioxide production by soil organisms in sufficient amount to retard absorption; (2) roots not only grow toward greater moisture, but they also grow in the direction of a greater oxygen supply; and (3) some salts occurring in fertilizers induce and others retard root growth.

Dr. Salisbury does not agree with the inference often drawn from Briggs' and Shantz's work on the wilting point that all plants are equal in their capacity to obtain water from a given soil. He admits that such a result may hold when transpiration is slow, but cites proof that entirely different results are obtained at high rates of transpiration and concludes: "Thus we may say that the amount of unavailable water which remains in the soil when a plant permanently wilts is a quantity which varies not only with the kind of plant and type of soil, but also with the external conditions at the time."

The main points may be summed up as follows:

1. We can increase the water-retaining power of the soil by increasing its internal surface through the addition of organic material or fine-textured mineral particles, or, on the other hand, we can decrease its water-retaining capacity by introducing sand and thus diminishing the internal surface.

2. If precipitation is deficient we can add water. For the best results we ought to know the composition of the water in considerable detail and we ought to use tepid water. Successive light waterings are usually more beneficial than a few heavy ones because less air is displaced in the soil and because heavy waterings, by furnishing easily displaced liquid, accelerate the leaching out of nutrient salts. The latter point is of interest, since nurserymen in this country, where moisture conditions are much less favorable than in Great Britain, have sought to induce deeper rooting by applying water relatively infrequently and heavily.

3. By cultivating the soil we loosen its texture and increase its pore space which is directly connected with penetrability, water content, and rate of flow. Hence cultivation makes possible a greater root development for the same expenditure of energy and makes available more water.

4. As some chemicals commonly used in fertilizers favor and others inhibit the growth of roots, we can influence concentration of roots by manipulating their chemical environment.

Paul O. Rudolf,
Lake States Forest Experiment Station.

The Forests of Sweden. By Thorsten Streyffert. *New Sweden Tercentenary Publications. 72 pp. Illus. Alb. Bonniers Boktryckeri, Stockholm. 1938.*

In 1638 a Swedish colony, named New Sweden, was established in what is now Pennsylvania, New Jersey, and Delaware. The 300th anniversary of the founding of New Sweden was recently observed in Wilmington. The present publication, translated by Wayne Lobdell, is one of a series designed to acquaint the American public with Swedish arts and industries. That forestry should receive a prominent place in such a series is easy to understand after reading this treatise.

More than one-half the total area of Sweden is wooded. Pine and spruce are practically the only important commercial species. Forest industries rank next to agriculture in number of people employed. Forest products account for one-seventh of the national income and one-half of the exports.

What forest industries mean to labor may be understood from the fact that out of a population of 6½ millions, 255,000 workers, reduced to a full-time basis, find employment in the mills or forests. At times the number rises to 400,000 in logging and silvicultural operations alone. Timber is an important product of the farms and is, to a large extent, cut and marketed by the farmers themselves. In the sparsely populated rural districts, about every second man between the ages of 18 and 65 years works in the woods during a portion of the winter season. This opportunity for part-time employment and cash income is a boon to the small farmer.

Owing to the influence of the Gulf Stream and the fact that night gives way to day during the summer months, the forests are pushed much farther north than would otherwise be the case. Even so, the conifers of northern Sweden live near their minimum temperature limit, and for

this reason mountain ranges are often barren. Approximately 22,000 square miles, or one-seventh of Sweden's land area, lies above timber line.

As in other countries where the forests have been under management a long time, the trees are smaller and are more densely spaced than in our virgin stands. Logs over 12 inches in diameter make up only a small part of the total mill supplies; nearly half of the lumber is less than 6 inches wide and only 15 percent is more than 8 inches wide.

Since wood production on the basis of sustained yield has practically reached its limit, the best opportunity for expansion lies in greater utilization of waste. A considerable amount of waste material goes into sulphate cellulose and wall board. An important by-product of sulphite pulp waste is ethyl alcohol, used primarily in mixture with gasoline for automobiles. The present annual production of 7.5 million gallons of alcohol could, theoretically, be increased to 27 million gallons, which is equivalent to one-seventh of Sweden's annual gasoline consumption; but alcohol can still not be produced cheaply enough to compete with imported gasoline.

About two-thirds of all the raw material is floated to the mills, and the remaining one-third is transported by rail, motor truck, or occasionally by horsepower. The mileage of streams developed for log driving is placed at 20,365, whereas the railroad systems of the whole country aggregate only 10,000 miles. In the main forest regions the average distance from stump to driveable stream is less than 2 miles. Truck roads are replacing ice roads for moving logs to the streams, and truck hauling is also replacing railroad transportation where the distance is less than 50 miles.

Ownership of productive forest lands is classified as follows:

	Percent
State	18.3
Other public ownership	5.8
Company holdings	25.8
Other private (farmers' woodlots, estates, etc.)	50.1

Since 1875, the state has purchased 1,410,000 acres at an average cost of about $10 an acre.

Forest legislation dating back to 1903, and further developed in the Forest Conservation Law of 1923, specifies certain minimum requirements in cutting and restocking. Enforcement is in the hands of a County Conservation Board, which also acts in an advisory capacity and aims to exceed the minimum requirements wherever possible. Small owners apparently give the most trouble because with them the temptation to overcut and neglect reforestation is strongest. In Lapland, where farming is very precarious, stringent regulation is necessary because forests are considered necessary to supplement the farm income. Large operators generally consider that it pays to practice good forestry; they employ their own technical personnel and are little subject to government regulation.

Forest grazing extensively practiced on farm forests "has hindered natural reproduction of the stands and also damaged the growing trees." Segregation of timberlands and pasture lands is listed as "the next large task facing Swedish forestry."

Intensive silvicultural practice on the better and more accessible sites takes the form of planting, thinning, and drainage. Planting has declined in recent years, because extensive areas needing artificial reforestation have now been planted, and because of a growing preference for natural restocking. Impressive figures are given on the extent of drainage. During the past 31 years 38,600 miles of drainage ditch have been dug in farm forests, with state aid; during the same period the larger "forest companies" have dug some 12,000 miles of ditch without financial assistance (except during the recent depression); state forests account for an additional 20,000 miles, making a grand total of some 70,000 miles of drainage ditch. In part, drainage has been for the purpose of afforestating bogs; in the main, it has been applied to lands already forested but too moist for good tree growth. Drainage ditches cost from $244 to $292 per mile.

The foregoing accounts of grazing damage and drainage ditches are interesting in view of recent announcements to the effect that pine browsing in our own Southwest occurs only where water is scarce, or other conditions are such as to aggravate thirst.

For several years past I have been responsible for the reviewing of Swedish literature on soil and water conservation. Much to my embarrassment I have been obliged to report that I could find no articles on this subject. Inquiry from several Swedish foresters brought the reply that this is not an important problem in Sweden. The following quotation from Streyffert throws further light on the subject:

"It should be noted that the protection forests

found in the mountains of Sweden are of a different nature to similar forests in other countries. In Sweden these forests are protected to insure a continued forest growth because the local population depends on it, while in most other countries 'protection forest' implies the prevention of erosion and floods. No erosion occurs where the soil is covered with moss and berry bushes typical of the moraine soil of Swedish landscape, nor even if the forest vegetation is cleared away. Also the frequent occurrence of bogs and swamps helps to absorb and hold the rainfall and thus regulate stream flow. On the whole, it can be said that the motive behind forest legislation in Sweden both in this and in other instances is primarily to insure a sustained yield of the forest resources. Investigations also have shown that the previous views commonly held concerning the forests' great and beneficial influence on the climate have, for this country at least, been greatly over-estimated. It may be different of course where farming is performed on marginal lands, in which case the presence or non-presence of forests may be the deciding factor."

A national forest survey was conducted during the years 1923 to 1929. Since the stands are continually changing, a second survey was started in 1938.

The land area in all of Sweden below timber line is classified as follows:

	Percent
Productive forest	65.7
Bogs and swamps	16.6
Other unproductive area	3.1
Cultivated	14.6

Large portions of the forest area bear stands that are considered too open for good yields. Making allowance for certain unpreventable conditions, the author comments "Such a percentage is higher than should be the case where careful forestrv is practiced and satisfactory reproduction follows felling."

Annual growth averages 28.4 cubic feet per acre for the whole country; in southern and middle Sweden the average is 40.3 feet, and in northern Sweden 22.6 feet.

Growth figures produced by the forest survey indicate a slight margin of yield over consumption, thus allaying previous fears of overcutting. It is pointed out, however, that in the overmature stands of northern Sweden cutting will probably exceed increment for a number of years to come, whereas in the second-growth stands of southern Sweden the reverse relation will prevail.

On the basis of available raw material, Swedish forest industries have reached the limit of their capacity for expansion except as increased yields may be expected as the result of management. In the author's opinion, the greatest opportunity for expansion lies in the development of new methods for utilizing wood waste.

G. A. PEARSON,
Southwestern Forest and Range Experiment Station.

A Dictionary of Wood. By E. H. B. Boulton. *205 pp. Illus. Thos. Nelson and Sons, Ltd., London, Toronto, and New York. 1938.*

This book resembles a dictionary only in that the woods described are arranged in alphabetical order. *One Hundred Commercial Woods* would have been a more informative title, since it describes just 100 kinds of woods that are used or give promise of being used in the British Isles. The description of each species, which covers scientific name, family, geographic distribution, color, figure, workability, durability, seasoning, weight per cubic foot, comparative strength, size, availability, uses, and finishes, is given on the right-hand page while a small half-tone reproduction of a photograph of a piece of the wood is given on the left-hand page. The species described are not limited to the British Empire but include boxwood from Asia, Japanese oak, red lauan from the Philippine Islands, and pencil cedar, bald cypress, red gum, magnolia, sugar pine, tupelo, and others from the United States.

ARTHUR KOEHLER,
Forest Products Laboratory.

Philippine Woods. By Luis J. Reyes. *Philippine Dept. Agric. and Commerce Tech. Bull. 7. 536 pp., 88 pl. 1938.*

This publication fills a long-felt need among those interested in the identification, properties, and uses of Philippine woods. It replaces, to a large extent, Schneider's Bulletin 14, *Commercial Woods of the Philippines: Their Preparation and Uses*, which was published in 1916 and has long been out of print. The present work, however, goes into more detail regarding wood structure. Descriptions are given of 264 species of timber, covering the following features: distribution, supply, size, uses, color, grain and texture, gloss, taste and odor, density, hardness, width of sap-

wood, growth rings, vessels and their contents, parenchyma, resin canals, rays, pith flecks, and fibers. Only structural features visible with the naked eye or hand lens are included; that is, microscopic features are not described. The terminology used is that adopted by the International Association of Wood Anatomists. A photomicrograph of a smoothly cut end surface of each species at a magnification of 15 diameters is reproduced.

In the appendix the woods are classified into four groups according to stumpage charges, weights, allowable unit working stresses, relative durability, comparative resistance to dry-wood termites and powder-post beetles, shrinkage, and chemical composition. There is also a long descriptive table covering size, supply, color, grain, weight, strength properties, durability, and uses of Philippine and some American species. There is no comprehensive table of actual values for mechanical properties, as is given in the old Philippine Forestry Bulletin No. 14, but such values are given in the text under many of the species described.

ARTHUR KOEHLER,
Forest Products Laboratory.

Internationale Titelsammlung für das jahr 1937. (International List of Titles for 1937.) Compiled by Franz Grünwoldt. (*Supplement to Forstliche Rundschau.*) *272 pp. J. Neumann, Neudamm and Berlin. 1938. Pr. 18 RM (12RM to subscribers to Forstliche Rundschau).*

"The object of science is the systematic search for the truth. . . . Knowledge of the steps which have been attained so far, that is, of all the results which have been obtained in any one subject of inquiry, is indispensable in the difficult and arduous search for the truth. Without this knowledge all searching remains amateurish. . . . As long as scientific work was restricted to a few people of a few nations, a scientist could survey the results of the work of his predecessors or contemporaries on a particular subject without the need for special aids. Since science has attained international scope and scientists and centers of investigation have multiplied greatly, it has become impossible to obtain at a given time a comprehensive survey of all the work and results completed on one subject without the help of especially developed aids. Consequently, the lack of such aids must lead to incompleteness, one-sidedness, deficiency in knowledge of the facts, in short, must lead to a further imperfection of the scientific work. . . . Ignorance of the wealth of modern international forestry work and the daily progress made leads unfortunately often to a forced or self-satisfied 'mental self-sufficiency' which is satisfied with the knowledge of the results of the forestry work of the respective country or of a certain individual language group. Such a condition is a serious hindrance to the development of forestry."

Thus Dr. Heske introduces this first compilation of titles of the world's forestry literature, published under the auspices of his Institute for Foreign and Colonial Forestry at Tharandt. This issue, which covers material appearing in 1937, includes approximately 6,500 titles, classified geographically within the general frame of the Flury system.

The titles of papers and books are given in the original language, with German translations, but without abstracts or comments. It is planned to publish subsequent issues quarterly. For convenience in preparing card catalogs, a special edition is to be printed on gummed paper. Use of the list is greatly facilitated by a more or less polyglot subject index.

Dr. Heske recognizes that the coverage of the literature is not complete, particularly the Turkish and Spanish material. The American literature appears to be well represented, including official publications, books, technical, and trade journals.

W. N. SPARHAWK.

Forêts Privées. Gestion—Régime Fiscal—Reboisement des Terrains Incultes—Propaganda Forestière. (Private Forests: Their Management, Fiscal Control, Reforestation of Waste Land, and Forestry Propaganda.) Vol. I. Europe. Compiled by Geza Luncz. *386 pp. International Institute of Agriculture, Rome. 1938. Pr. 25 lire.*

The International Forestry Congress of 1926 requested the International Institute of Agriculture to prepare a report on the legislation and policies of the various countries for promoting private forestry. Subsequent congresses adopted similar resolutions. This report, prepared by Dr. Luncz of the Hungarian Forest Service from replies to questionnaires submitted by the forestry agencies of the countries concerned, is part of the result.

It contains a wealth of information on the status of private forestry in all the countries of Europe except Russia, where there is no private forestry, and Turkey, which is to be treated in a later volume dealing with Asia.

Among the subjects covered are: public restrictions on management of private forests and opinions as to the adequacy of existing laws, taxation of private forests, prospects for increasing yields of private forests and increasing their protective value, afforestation of idle land and associations for carrying out such work, measures for stimulating afforestation by private owners, species and methods employed in private forestry, popular forestry education, pending and proposed legislation, and opinions on the desirability of international cooperation in forestry matters.

Although some place greater emphasis on one method and some on another, all but a few of the European countries follow the "three-point" policy of public assistance to private owners, public regulation of private forestry, and public ownership of forests. All of the methods that have been proposed for the United States have been tried in one country or another; the degree of success attained has been as varied as the methods employed.

As far as known to this reviewer, there is no other single publication containing the information that is packed into this report. It is perhaps somewhat spotty in character, a result to be expected from the questionnaire method of collecting the material, but on the whole it appears to be accurate and informative. The 38-page bibliography, consisting of more than 600 titles, should be especially valuable to those desiring to study any of the countries in more detail. The present publication is in French. In view of the wide interest in forest policy in the English-speaking countries, and particularly in view of the predominant role of private forestry in most of them, it is to be hoped that an English edition may soon be forthcoming.

W. N. SPARHAWK.

American Place Names. By Alfred H. Holt. *220 pp. Thomas H. Crowell Co., New York. 1938. Pr. $1.75.*

An interesting, original, and at times amusing book of reference on how the natives pronounce the name of their town. The author's original method of telling the average reader how to pronounce a place name by the use of rhyme word or phrase is a practical method at least. This method no doubt would be wholly unacceptable to lexicographers whose hieroglyphic of long, short, closed, and open *a*'s and other vowels is often totally unintelligible and useless, to this reviewer at least.

For example, Holt says Etowah, Tenn., rhymes with "*Pet* a ma"; "Blough, Pa.—Exhibit A in our collection of "*ough*" oddities—rhymes with "*plow*"; Metuchen, N. J., accent on "*tutch,*" rhymes with "the scutcheon"; Ojai, Calif., is just "*Oh, High*"; and Los Angèles is "Lawes Angeleez."

One notes some errors. Henrico, Va., is actually pronounced Hen-*reek*-o, reek accented, in Virginia, though Holt says it's Hen-*rike*-o. Botetourt, Va., is called "*Botty-tot*" ("*tot*" accented) in the Old Dominion, and not to rhyme with "*spotty shirt*" as the author alleges. For Houston he gives "hew", "hoo", and "house", though in Virginia where Sam came from and where there are still many Houstons, we call it "Hooston." Surprisingly, Louisville, Ky., is omitted, whether *Looey-ville* or *Lewisville;* though Saint Louis is Saint *Lewis* as preferred at home, the author says.

Most of the jaw-breaker Washington State Indian names are given correctly, and his Arizona, New Mexico, and California Spanish names are clarified.

Of Montague, the author correctly says that everywhere except Texas it's pronounced with three syllables—last "*gew,*" but Lone Star Staters for some unknown reason call it in two syllables, as if spelled "Montaig."

Regrettably few national forest names are included, "Wash-it-aw," "Heelah" and Nantahala, though it must be admitted that there is badly needed a pronouncing dictionary (even for federal forest officers) for the large number of unpronounceable (for the general reader) national forest names. For example: Chequamegon, Homochitto, Croatan, Ocala, Nicolet, Tongass, Chippewa, Ottawa, Uharie, Chattahoochee, Kisatchie, Monongahela, Ochoco, Toiyabe, Weiser, Malheur, Uncompahgre, Cochetopa, Arapahoe, Absaroka.

Probably no other English-speaking country has so many non-English place names as these United States. Because of our polyglot names, this book has real reference value for radio users, public speakers, and many others, and the author adds that "the railroad brakeman and train an-

nouncers could make profitable use of this book. This is just a pious wish." He also says, "This is no book for purists."

JNO. D. GUTHRIE.

Results and Application of a Logging and Milling Study in the Western White Pine Type of Northern Idaho. By E. F. Rapraeger. *Univ. of Idaho Bull. Vol. 33, No. 16. 55 pp. 4 pl. 6 fig. Published by Western Pine Association, State Forester of Idaho, and School of Forestry of University of Idaho. 1938.*

The presentation of the results of logging and milling studies is difficult because of the tremendous volume of detailed cost and value data required for a thorough understanding of the subject. Even though this publication contains a vast amount of tabular data of this nature, it is easily read because of the systematic and logical arrangement of the subject matter, which is presented under four main headings: "Procedure in Field," "Results of Study," "Application of Results," and "Computation and Analysis of Data." A good index enhances the reference value of the bulletin. The chapters on "Procedure in Field" and "Computation and Analysis of Data" will be especially helpful to anyone making a logging and milling study. Four full-page plates depicting the process of match-block manufacture and the conformation of white pine trees, obviously poor reproductions of the original photographs, are included.

The remaining volume of western white pine is given as 12 billion feet log scale, of which 4.5 billion feet is located on the national forests of northern Idaho, northeastern Washington, and western Montana. Distribution of age classes is not uniform, as there is a decided shortage of timber from 40 to 100 years of age. Another bothersome forest management problem inherent in the white pine type is the volume of associate species, varying from a few trees to 85 percent of the total volume. Conversion value of these species is negative except for a limited amount of western red cedar, lowland white fir, hemlock, larch, and Douglas fir situated within reach of good truck roads, and then only for the shorter hauls. As a solution to the associate species problem the area-selection method of cutting is offered, which, simply stated, is logging of those areas on which returns are the highest because of composition of stand and tree quality. The author points out that practical loggers have used this system in varying degrees for many years, and presents the detailed economics governing the scientific application of a system heretofore applied by rule of thumb.

The bulletin is well worth careful study by students and practicing foresters interested in the economics of logging and milling.

I. V. ANDERSON,
Northern Rocky Mountain Forest and Range Experiment Station.

Forest Mensuration. By Earl G. Mason and Harry I. Nettleton. *4th edition. 131 pp. Illus. (Lithographed.) Oregon State College Cooperative Assoc., Corvallis, Oregon. 1938. $3.50.*

"The study of forest mensuration can be approached from two viewpoints: first, as the science of measurements, and second, as the art of taking inventories for lumbering and forestry enterprises. To attempt to combine the two viewpoints in one text is apt to cause the student to become confused. No attempt is made, therefore, to delve thoroughly into the science of forest measurements or the related art of making tables for the mensurationist to use."

Thus its preface labels this a textbook purely of practical mensuration; by design of the authors it is unencumbered with the detail of the investigative and basic theoretical phases of the subject. Illustrative of the streamlined economy of fundamental theory is the Introduction, which defines the subject, describes the desirable relation of accuracy standards to cost and to objective, covers the elements of sampling, averaging, experimental error, curve fitting, and alinement chart methods, all in six pages.

The body of the book is divided into three parts. Part 1, Log and Wood Measurement, describes in a clear and capable manner units of measure, log rules, scaling, and log grading practice. Part 2, Cruising, covers the measurement of dimensions and volume of trees, construction and use of volume tables, and methods and technique of timber cruising. The third part, devoted to dicussion of growth, progresses from growth of the individual tree to even-aged and thence to many-aged stands.

Considering the viewpoint from which the text is written, that of applied economic mensura-

tion, the material is well-chosen and well-balanced. Examples used apply to principal species and types with which the West Coast student is familiar and add much to the value of the text. Brevity and terseness have been attained in some sections at the expense of detail. For instance, the discussions of volume and yield-table construction might be more readily grasped by the student if the steps were further illustrated graphically. For those interested in deeper study and more detail of procedure there is a suggestive list of authoritative references at the end of each section.

An innovation is a description of the rots common to western conifers, their identification from exterior indicators, and their effect on net volume of log and tree. This material should be of considerable help in teaching students to make defect allowances in scaling and cruising.

The appendix includes the common log rules, North Pacific log grades, specifications for minor products, standard volume tables and yield tables for the principal species of the region, and consolidates much material useful to the local cruiser and scaler. The lack of an index is largely compensated by a detailed table of contents.

This text is essentially in the encyclopedic mode, the style laconic. It admirably describes the methods that are being applied commonly in every-day woods practice. Professors Mason and Nettleton have frankly defined their objective, and have developed with order and directness the principal procedures of applied economic mensuration.

P. A. Briegleb,
Pacific Northwest Forest Experiment Station.

The Use of Controlled Fire in Southeastern Game Management. By Herbert L. Stoddard. *19 pp. Thomasville, Georgia. 1939.*

This pamphlet was issued for the information of the members of a cooperative association of owners controlling more than 2 million acres of lands held for game production. It sums up the findings of the author, which were first given adequate publication in his book *The Bob White Quail,* published by Chas. Scribner's Sons in 1931.

The maintenance of proper environmental conditions for the birds is the keynote of the article, and the controlled use of fire is the only efficient means of preserving these conditions. The following extracts are quoted directly from the pamphlet.

"The periodic plowing or harrowing of broom sedge and sod-bound areas of old fields and open woods are practical, but expensive, measures for this purpose. On pineland and sedge fields fire is, and of necessity must be, the agency mainly relied upon for control of ground cover."

"Fire is now becoming more widely recognized as an extremely useful tool in maintaining lands for quail and certain other upland wildlife of the region, and the value of its age-old employment is becoming increasingly evident."

"As a result of the vast propaganda against burning, the majority of conservationists (especially those unfamiliar with ecological conditions in the Southeast) are still prone to condemn its use *for any purpose* as against the public interest."

"Due to the accumulation of evidence we believe that burning at the *right time,* in the *right amount,* with *proper frequency,* and in a way to accomplish the desired results with the *least damage to other interests,* is the most important single operation involved in quail management in the region. We differentiate sharply between *controlled burning* and *uncontrolled burning.* If a choice had to be made, however, between late winter burning of the kind long carried on by natives of the region (who know more about fire use than they are usually given credit for) and the total fire exclusion policy so strongly advocated by some, the former would be vastly preferable *so far as wildlife interests are concerned.*"

"Experience during the past fifteen years over quail lands of the Southeast has fully shown that more quail lands are being damaged, so far as quail production is concerned, by mistaken attempts at fire exclusion than by any other single factor. The decline is coincident with (and caused by) the accumulation of pine straw, wire grass, broomsedge and other grasses, and debris which excludes the birds from a diminishing food supply. Then all too frequently, during a period of summer drought and high wind the inevitable happens—the woods catch fire accidentally (from lightning, a cigarette butt, or other cause)—and the result (owing to the accumulation of highly combustible ground cover) is denuded land and a fire-damaged forest, destitute for a time of valuable wildlife and scenically an eyesore. . . . Properly controlled burning at in-

tervals of from one to three years is the best known insurance against destructive conflagrations in pine forests."

"The period from mid-February to April is considered most favorable for the bulk of the burning during an average season."

"In quail country which shows a tendency to choke up with oak, sweet gum, and other deciduous brush, special care is necessary, for neglect of the burning for a year or two may entail expensive debrushing operations to bring the vegetation again under control."

"We are of the opinion that the benefits to be derived from *intelligent use of controlled fire* are so obvious that they will soon be used to a greater extent by southeastern landowners who may have only an incidental interest in quail and other upland game. Probably much of the difference of opinion and confusion regarding the use of fire in the Southeastern Coastal Plain has resulted from a lack of understanding on the part of fire-exclusion enthusiasts of conditions prevailing in the region before arrival of the white man. . . . We conclude that fires were frequent and widespread during prehistoric time."

"The conditions under which developed the magnificent virgin stands of southeastern pines having included frequent burning, surely carefully controlled fire for the benefit of animal life adjusted along with the forests to periodical, though uncontrolled, burning through the ages has the merit of following an established and successful procedure. In our opinion, to exclude fire permanently from the park-like pine lands of the Southeast is to jeopardize both the flora and fauna and to contribute to their replacement by other and inferior types of animal life and vegetation. How many who are advocating total fire exclusion in this region have seriously considered the consequences of disturbing this age-old adjustment?"

H. H. Chapman,
Yale School of Forestry.

Lessons in Kiln-Drying. By Harry D. Tiemann. *110 pp. Illus. Southern Lumberman, Nashville, Tenn. 1938. $2.*

Once again Tiemann has published a book on kiln-drying and this time it takes the form of 31 articles or lessons on the subject.

In the early lessons there is an excellent explanation of needs for dry kilns and the phenomena of moisture transfusion and evaporation. Some intricate formulae to determine time required to dry wood are included.

In Lesson 6 the need for forced air circulation by fans is stressed and it is concluded that for drying refractory woods an air spread through the loads of 6 inches a second is ample. Mention is made of the obsolete water-spray kiln, but a popular method of movement of air in kilns by steam-jet blowers is omitted. It is also asserted that high-speed circulation might be harmful in producing vacuum or stagnant areas in piles.

In the lesson on humidity control Tiemann cites ancient history, early patents, and the use of water sprays, all of which have been obsolete for 20 years, and gives only two short paragraphs on the use of steam for humidifying, which is today practically 100 percent in use.

In the discussion on modern kilns much stress is placed on the various applications of circulating fans, with some good cuts to show comparisons. Cold-drying sheds are briefly discussed, with the conclusion that their usefulness is extremely limited and the drying results questionable.

Control of temperature and humidity is discussed quite thoroughly and many cases cited. A few good cuts of kiln heating systems would have been helpful here.

Some interesting reading on thermostats and drying schedules, together with theory of moisture gradients is found in Lessons 11, 12, and 13. Lessons from 14 to 24, inclusive, and Lesson 30, deal with electrical methods of moisture testing, which would be of considerable interest to a physicist or electrical engineer.

The lesson on steaming should be both useful and interesting to any kiln operator and the discussion on collapse in drying is supplemented with some excellent illustrations.

On the whole the text is well-written and in the usual interesting Tiemann style. It should be interesting to students in kiln drying for its thorough explanation of many phenomena in kiln drying, providing they haven't forgotten their college physics and mathematics.

So much good material deserves a better cover than thin pasteboard.

Hiram L. Henderson,
New York State College of Forestry.

CORRESPONDENCE

Editor, Journal of Forestry.

Dear Sir:

The article in the January issue of the Journal by C. H. Hammar entitled "Extending Public Control and Management of Forest Land Without Purchase" is one of the first specific proposals for public control which has been submitted to the profession. I should like to outline a few major objections to this proposal, based upon my experience in public regulation during the N.R.A. Lumber Code and subsequent studies in forest management in the Lake States Region, and then to outline what seems to me to be a more practical and justifiable alternative.

1. Mr. Hammar's main thesis is that public control and management would be cheaper under his method than outright purchase. He has neglected the fact that acquisition of forest land is equivalent to an investment, whereas the purchase of control is simply a right to manage in which the public equity is certainly dubious. Dollar for dollar, the purchase of land by the public will be a sounder and more productive investment in the long run.

2. Since a large proportion of the land to come under this program is tax delinquent, the first step toward public ownership has already been made at no cost. Wisconsin has built up a very satisfactory system of county forests on tax reverted lands at practically no initial cost.

3. This proposal leaves unsolved the question of how to bring about proper management practices on private lands owned by individuals who do not wish to participate. Unless autocratic methods are resorted to (which Mr. Hammar abhors), how can the program be sufficiently effective to get at the most difficult forest problem, namely, the proper management of standing timber? If they are not used, the cost of purchasing control will have to be equal to the value of the stumpage, since the timber is an asset which private owners would hesitate to relinquish. If full stumpage price must be paid, a small additional amount would purchase the land as well.

4. What assurance is there that in this attempt to escape from the use of autocratic methods, the complex legal, administrative, and accounting problems likely to arise might result in an even more difficult problem of bureaucracy?

5. Attempts to shift private responsibility on to public shoulders has too often meant that the public foots a disproportionately large share of the bill. Compromising public needs in this way usually leads to combining the worst features of private and public ownership without any corresponding advantages.

My feeling is that Mr. Hammar's proposals rest on several questionable assumptions—not stated but implied throughout. The first is that there is something inherently fine in private forest ownership which ought to be preserved, even through government subsidy if need be. Surely, millions of idle, tax delinquent acres bear silent witness to the contrary. The owners of most of these cutover lands have stripped the timber, stopped tax payment, and otherwise indicated that they no longer wished to retain ownership. Is there any reason why the public should bear the whole burden of rehabilitation of a privately created public liability and then allow the owners a share in the income which they had no part in producing? The second assumption is that public regulation of private lands cannot be achieved satisfactorily without having full control of management and operation rest with a public administering agency. In fascist countries, slight modification of this method is being followed with very dubious success. Mr. Hammar does not show why the system followed by some democratic countries of setting up minimum standards for forest cutting could not be more satisfactorily substituted for his method. This would be even less expensive, more completely effective, and less administratively difficult than the purchase of control. In addition to this set-up for private timberlands, permanent public ownership of tax delinquent cutovers could be accomplished at little cost.

It is this latter course which seems to be a more desirable one, in view of our own experience and that of others, on which to plan an American forest policy for the coming years. With this in mind, I have prepared an outline of a policy which tends to work in the direction of the course mentioned above. It is based upon the assumption that the regulation of private cuttings is both constitutional and a necessary protective measure. Further, it assumes that the use of minor forms of subsidy, such as fire protection, tax readjustment, forest credits, and in some cases, outright grants, may be justified to the extent to which privately owned forests contribute to the public welfare. In return for these aids, the public has a right to expect a full measure of value returned in the form of properly managed forest resources. The following proposal assumes that federal legislation will be necessary for the initiating of the work and may require enabling acts by the individual states.

I am making comments and presenting the proposal as an individual member of the Society.

CHARLES H. STODDARD, JR.

PROPOSED FOREST POLICY LEADING TO REGULATION OF PRIVATE TIMBERLAND

BY CHARLES H. STODDARD, JR.

I. A National Forest Planning Board shall be set up with members of Forest Service, state conservation departments, and private forest landowners equally represented. Each major forest region shall have regional control boards with the same proportional representation which are responsible to the national board. Further decentralization into district committees shall be followed. The national board working through its regional boards shall have the power to carry out the following provisions:

A. All rural lands in each state shall be zoned into agricultural districts or forestry districts according to major long-time land use. This work shall be done in cooperation with state planning commissions and other cooperating agencies. Each forestry district shall be further subdivided into areas which shall be designated to the Forest Service, states, or counties for administration of present or future public lands therein.

II. The following silvicultural requirements shall be considered minimum for all private forest owners:

A. *Forestry Districts*

(1) No contiguous areas of standing timber in excess of five (5) acres nor greater than 5 percent of the total ownership shall be clear-cut, except where is can be proved to the district committee that salvage requirements, or necessary silvicultural measures deem otherwise.

(2) All liquidating operations shall be handled under a system of two-cut selective liquidations based upon the shelterwood principle. (May be modified according to type, etc., if satisfactory substitute is accepted by the board). (It is suggested that forest credit loans be made on the residual stand after a first cut to those owners who are hard pressed financially. These shall be secured by the remaining timber and paid off after the necessary interval to get reproduction established).

(3) Areas of coniferous slash must be broken up by dragging all slash away from logging woods a minimum number of feet.

B. *Agricultural Areas*

(1) Forest lands which are less than fifty acres in size and part of operating farms shall be exempt from above rules except clear-cutting, II. A. (1).

(2) Larger areas than 50 acres shall be subject to the regulations in II. A., except for the slash piling requirements.

IV. The national and regional control boards working through district committees shall have the power to act as the public planning agency in all questions of forest economy, and in addition:

A. To plan the flow of forest products according to public needs and requirements of proper land management.

B. To enforce the regulations provided for in Section II with the following penalties:

(1) For clear-cutting—the public will require the owner to reforest cutover lands or it will do the job and assess the cost to the owner.

(2) On slash areas, the work of breaking up hazardous slash will be done by the public if the owner fails to do so and the cost charged to him.

C. To enter into purchasing agreements with private owners to acquire partially cut standing timber for addition to public forest areas.

D. To issue noninterest bearing forest purchase bonds guaranteed by the government and secured by the land and timber for acquisition of additional lands where need be.

E. To make forest credit loans to owners needing financial assistance.

F. To work for uniform forest tax laws, which will be equitable to growers of forest products.

G. To provide technical aid in formulating management plans for owners of 100 or more acres who are planning on continuous production forestry.

H. To encourage the cooperative marketing of forest products to provide stable outlets for small owners, especially in agricultural areas.

I. To provide adequate fire protection.

J. To pass on A.A.A. grants for forest practices on farm woodlands.

K. To direct the efforts of extension foresters in assisting small owners to practice proper forest management.

DEAR PROFESSOR CHAPMAN:

Referring to your notes of October 12 and November 28 on the alleged reduction in numbers of the Alaska brown bear on Admiralty Island, Tongass National Forest, southeastern Alaska:

Alaska brown bear conservation.—The supervision of the bear management plan for Admiralty Island, Tongass National Forest, which I helped draft in 1932, has been of special interest to me and I have repeatedly looked for indications of any decline or increase in the bear population there. The possible annual kill that might be allowed without diminution of the existing population was conservatively calculated in the plan at 100 animals, but to be sure of operating on the safe side the maximum allowable kill was set at 35. So far the take has not exceeded this lesser figure in any one year since the plan was put into effect.

Alaska forest officers, game wardens, and practically all others who have a knowledge of game conditions on Admiralty are in agreement that the animals on the island have materially increased in number since 1932, when the census for the management plan was made. Several factors help to account for this: fewer people are working on and near the island now than for 15 years past as some canneries and other industries there have closed down during this period, and especially within the last five or six years; the number of visitors has not materially increased; as provided in the plan, the Game Commission and the Forest Service have maintained a boat patrol around the island during the season when bear are concentrated on the salmon streams and when cannery help and commercial fishermen are working in the locality.

Alaska brown and grizzly bears have been increasing in numbers throughout their entire range in Alaska for at least the last twenty years, that is, since prohibition of sale of the pelts removed the profit motive in killing, and since the Alaska Game Commission started its effective regulatory and policy work. Every outdoor Alaskan, and all of the big game hunters from continental United States who come here, can attest to this widespread increase.

In view of the above, it doesn't seem logical that the bears on Admiralty should be decreasing, as was contended by a recent Alaska visitor from New York City. I want to assure you, and others who are especially interested in the large brown bear, that these animals are not decreasing. I should know the facts as I have charge of the island, am one of the joint administrators of the bear plan, and have been intensely interested for many years in maintaining a large bear population there. I am in continuous contact with the situation through local forest officers and personal field inspections, and through talks with guides, big game hunters, local sportsmen, and others who have occasion to go on the island. Incidentally, Dr. H. L. Shantz, in charge of the Division of Wildlife in our Washington office, inspected the island in 1938, and expressed himself as well satisfied with the bear situation.

You may be interested to learn that we made an estimate this summer of the number of bears on Chichagof Island. This is the second of the three brown bear islands in the Tongass National Forest that we propose to cover with bear management plans. The third is Baranof Island. Chichagof was found to have 940 animals on an area of 2,100 square miles, or one animal to 2.23 square miles. The Admiralty figures in the 1932 census were 900 animals on 1.664 square miles, or one to 1.85 square miles. These populations seem to be quite dense for a large wilderness animal. We think they are above the average for the entire 96,000 square miles of the big brown and grizzly bear range in Alaska. Next year a bear census will be made on Baranof, area 1,604 square miles.

I am firmly convinced that the Forest Service and the Alaska Game Commission can maintain, and perhaps materially increase, the brown bear

population of these three national forest islands in southeastern Alaska under integrated management plans for the bear and the other resources. Lumbering, especially, need not materially interfere with the bears. The proportion of the total area of each of these islands that can be logged does not exceed 40 percent for Admiralty and is less for the others. The remainder of the area is rugged and does not carry merchantable timber. The 75 to 85 year timber rotation used here results in such a small portion of the island being worked on at any one time that bears will have no difficulty in keeping away from the activity centers. No extended logging is now being done here and none is in immediate prospect. However, experience has shown that the cutover areas contain more food for wildlife, including bears, than the virgin forest.

The salmon streams are to be protected against any damage from logging operations and woods workers will not be permitted to molest either spawning salmon or feeding bears.

Of the total estimated range of the brown bear in Alaska—96,000 square miles—complete sanctuary is afforded to brown and grizzly bears on 10,000 square miles in the form of national monuments and game refuges. The sanctuary area in southeastern Alaska is about 4,000 square miles and consists in the main of the Glacier Bay National Monument of 1,820 square miles, and an area of open public domain and national forest land totaling 1,910 miles surrounding the monument.

The extensive range and high percentage of the sanctuary lands, strict hunting regulations, responsibility of the U. S. Biological Survey and its local agency, Alaska Game Commission, for conserving this outstanding game animal, and the bear management plans being prepared for the national forest ranges, should be sufficiently convincing evidence to destroy the contention that Admiralty Island must be set up as a super-zoo to provide against the extinction of the Alaska brown bear.

B. Frank Heintzleman,
Regional Forester.

Editor, Journal of Forestry.
Dear Sir:

As general editor of the *Forest Bibliography to 1933,* Parts II and III of which are reviewed in the Journal, (37:278-9) I hope I may be permitted to invite your reviewer's attention to four points arising from that review: 1. A list of all the subjects covered by the *Bibliography* is given in Part I, showing that insects and fungi are dealt with separately from other aspects of forest protection; 2. In the Preface, Part I, we state that all references are specifically confined to material in our library; 3. Numerous Japanese references are given; 4. I should be grateful for a list of important European forestry journals (apart from the Russian, of which we have several not yet abstracted) not represented in our library and containing summaries in English, French, or German (see Preface). Since the scope of the *Bibliography* was clearly stated at the outset, this brief protest at this condemnation for not having a different scope may perhaps be allowed. Your reviewer's final encouragement to our work is nevertheless greatly appreciated.

G. Guiney,
Librarian, School of Forestry,
University of Oxford.

Editor, Journal of Forestry.
Dear Sir:

On the editorial page of the January issue of the Journal it is pointed out that foresters pay too little attention to the background of their profession. This is only too true. Foresters are too busy trying to justify themselves to the public to give much thought to the "first forester." Regardless of that, few will deny that a good historical background is essential to an intelligent approach to forestry. As forestry in this country grows to be more than planting trees and fighting fires the profession will come to appreciate the need for understanding its own background.

The problems in forestry too often seem unrelated to those of the past. Yet there is much to be gained from it. It gives perspective and puts us in a better position to evaluate present day situations in the light of what happened in similar situations years ago. That is one thing that makes the study of history more than a mere mental exercise. In so far as the editorial sticks to that interpretation of history it is on justifiable grounds.

It may be that "forestry will never come of age intellectually until the great names—are as well known—as the great names in other fields of learning are known" yet to imply that forestry can increase its mental stature by associating it-

self with great names is a mistake. Full appreciation of such men as John Evelyn is a result, not a cause of maturity. Professions exist and grow because of the service they give, not because they have learned to evaluate the great men in their past. When that service is well understood and offered with an understanding of its place in the complex associations of society the profession can be said to have come of age.

Forestry—particularly private forestry—still has to justify itself in this country. It has many things to learn before it can contribute as fully to society as we think it should. That is a million times more important than blowing up our ego by "claiming" a great naturalist whose contributions in other fields were no less important than what we now call forestry.

Perhaps the worst aspect of this attitude is that in itself it is proof of our immaturity. One of the characteristics of immaturity is self-consciousness. This seems to me well expressed when the forester is asked to revere John Evelyn since by so doing he will be adding to the dignity and prestige of his profession. Is that not calling attention to the one thing that foresters hate to admit—namely that they are still seeking a place in the sun? Should we draw attention to it in our own JOURNAL by trying to put on airs like a *nouveaux riche* who surrounds himself with evidences of culture which he cannot bear gracefully?

Our maturity will come through perfecting the service our profession can give, not through trying to gain prestige by claiming relationship with great names.

WILLIAM P. HOUSE.

DEAR PROFESSOR SCHMITZ:

I have just read with a great deal of interest your editorial in the April issue of the JOURNAL OF FORESTRY. Unfortunately, I am not a college graduate or a technical forester, although for twenty-six years it has been my privilege to be very closely associated with technical men in all phases of the forestry profession who have been college graduates. I have seen a large number of these young men come from forestry schools into the U. S. Forest Service and have watched their development and progress over the years. My one regret has been that my father did not give me the opportunity to obtain a college education, as I find now that my efficiency in the official position I hold would be greatly improved and my work made easier had I been given the opportunity to train my mind in my early years through a well-rounded college education.

A large number of the graduates of our forestry schools have been fortunate in obtaining federal employment on conservation and forestry projects largely because of the huge unemployment relief appropriations made available. The C.C.C. program, so far as the Forest Service is concerned, opened the way for a very large number of these graduates. It has been an unprecedented opportunity and a considerable number of these boys have worked their way up to positions of importance and responsibility.

As I inventory the situation, the future is none too bright for the technical forestry student because of the economy wave taking momentum. There is a tendency to swing relief back to state authorities, expansions in regular appropriations will be difficult to obtain, and all in all the number of new appointments from the junior forester and junior range examiner registers will be fewer.

My work has dealt largely with the business and financial end of the Forest Service instead of the technical phases. I have been rather surprised for a long time to find that, in my opinion at least, a very large percentage of the forestry school graduates and new recruits into the Forest Service have been deficient in what I call practicability and good business judgment. Of course they acquire a certain amount of proficiency in this respect in the course of their Forest Service experience in the various lines of work. My reaction has been that the curriculum of our forestry schools has been confined to the technical phases of forestry and has not been balanced by sufficient training programs in business administration. In the Forest Service, at least, the natural ambition of a junior forester recruit is to advance to some high administrative position. The positions of forest ranger and assistant forest supervisor certainly require a very high standard of business training and judgment. The forest supervisor is the business head of a forest unit. He must understand modern methods of organization and financial management. It is he who prepares the initial plans which form the basis of our appropriation estimates. Yet very few of these men have had a practical training in their college career in business administration. They have learned these phases since their induction into our service.

Two or three years ago we were successful in having our executive assistant and administrative assistant positions reallocated to grade CAF-7 $2,600; CAF-8 $2,900; and CAF-9 $3,200 per annum. For the most part a very small percentage of these men are college graduates. Here and there we find such a man who has had forestry training. The executive assistant is the business manager of our Forest Service unit office and is the right-hand man of the forest supervisor in handling the office organization, supervision of clerical employees, preparation of financial reports, accounting, costkeeping, property accountability, and so forth. The supervisor, however, is responsible for all these activities on his unit and unless he has training and education along these lines, he is not in a position, in my opinion, to judge the efficiency and effectiveness of the administrative assistant's work in this regard. We are, of course, endeavoring to raise the standards of our clerical positions and we hope that in the future we will be able to obtain a greater number of college graduates having training particularly in business administration for these important positions.

It seems to me that men in these higher clerical positions would be far more valuable to the government and would have a better opportunity to advance to still higher positions if these men would have a technical forestry education. A certain percentage of our forestry school graduates, of course, are purely technically minded and would not qualify for administrative positions requiring a high degree of business management. They will be specialists rather than business administrators. However, there naturally would be a sizable percentage of our forestry graduates who would naturally be advanced to administrative positions requiring modern business methods, accounting, office organization, financial management, financial statistics, and other work of this character. This is becoming more and more important in our resource management.

It occurs to me that those forestry students who have an inclination or aptitude for this kind of work could well afford to take post-graduate work in business administration, accounting, and related subjects. Certainly our executive assistant and administrative assistant positions are now sufficiently attractive to afford a very good opportunity for our forestry school graduates who have this sort of training to advance through these clerical grades instead of following purely technical channels. It will be observed that the last notice of examinations issued by the Civil Service Commission for the junior forester and junior range examiner positions also included options in perhaps eighteen or twenty other subjects, one of which was business administration. Of course, in taking this examination the applicant would have to choose one option out of the twenty.

However, since the opportunities for appointment of a large number of junior foresters will probably be less than they have been in the past, it should prove profitable to the forestry students having adequate training in business administration to select that option. Moreover, if a graduate was appointed from the junior forester of junior range examiner register who also had training in business administration, it would be possible to transfer or promote him to the position of executive assistant or administrative assistant in the CAF grade without taking another competitive examination.

It is my opinion that the business administration field offers a real opportunity to the forestry student. We need more foresters who have had this sort of training. They should know the elements of accounting and costkeeping, modern clerical organization, and other subjects now generally included in business administration courses. A knowledge of typewriting is always a valuable asset, and is almost essential. In the Forest Service, and I presume it is also true in other bureaus dealing in various phases of forestry work, men in high administrative and supervisory positions, having entered the service from the junior forester, junior range examiner, or some other technical forestry eligible list, would be far more valuable to the government if they had training in business administration. Likewise, our executive assistants, administrative assistants, and others in the CAF grades in the higher brackets would be far more valuable to the government if they had a technical forestry training.

I give you this thought, therefore, that in my opinion there is a further opportunity for our forestry students to expand their education in the field of business administration. I feel also, that our forest schools should give consideration to including a comprehensive course in business administration in their forestry curriculum.

S. E. Schoonover.

Dear Professor Schmitz:

If my letter of the 17th has in it any points of value which you feel may be utilized to advantage, you have my permission to use it in any way you see fit. There was one point that I did not touch upon in my letter, but which I feel might be worth-while considering. My discussion dealt wholly with the opportunities for the forestry student in government work. It seems to me that the points brought out in my letter may also be well applied to opportunity for employment of the forestry student in private enterprise. Lumber companies, state conservation departments, and other agencies employ forestry students and certainly have great need for men having a well-balanced college training in both the technical forestry subjects and business administration.

As mentioned in my letter, it seems to me that the curricula of our forest schools should include comprehensive courses in business administration. There will, of course, always be need for specialists and research technicians in positions where courses in practical business administration would not be especially required. Those forestry students who have particular aptitude along these lines would not necessarily be obliged to spend their time in taking business administration courses. However, for the big majority of our forestry school students, it seems to me that a balanced course in practical business administration, coupled with technical forestry studies, is essential.

S. E. Schoonover.